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THE PROCEEDINGS

OF THE

TENTH RECIPROCAL MEAT CONFERENCE

IS RESPECTFULLY DEDICATED

TO THE MEMORY OF

TWO MEN WHO HAVE CONTRIBUTED

MUCH TO THE FIELD OF MEATS

M. D. HELSER

and

H. R. KRAYBILL

Their passing is mourned by many friends and associates, but the record of accomplishments they left behind will not be forgotten by those engaged in meat teaching, and research.

TLM

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of
TENTH ANNUAL RECIPROCAL MEAT CONFERENCE

JUNE 10-11, 1957

MORRISON HOTEL
CHICAGO, ILLINOIS

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June 11, 1957

(PROCEEDINGS - Cont'd)

PROCEEDINGS

TENTH ANNUAL RECIPROCAL MEAT CONFERENCE

MONDAY MORNING SESSION

JUNE 10, 1957

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The opening session of the Tenth Annual Reciprocal Meat Conference, held at the Morrison Hotel, Chicago, Illinois, June 10-13, 1957, convened at 8:45 o'clock, Dr. T. N. Blumer, North Carolina State College, Chairman, presiding.

CHAIRMAN BLUMER: Will the conference please come to order?

First of all this morning it is my privilege to present our main host, Secretary-General Manager of the National Live Stock and Meat Board, Mr. Carl F. Neumann.

MANAGER NEUMANN: Thank you, Chairman Blumer.

It does make some difference, I think, in the livestock and meat industry whether or not you, as key people and as leaders in the meat research and educational field, have a reciprocal meat conference year after year.

It seems that ten years ago there was a question as to whether this conference would continue. I think the fact that there is the largest registration in the ten-year history of the Reciprocal Meat Conference this year is proof certainly of what you think of the conference.

The directors and officers of the National Live Stock and Meat Board appreciate deeply and sincerely the fact that holding this conference and all the work and expense that you put out in connection with it is work and effort on your part over and beyond the call of duty. Certainly, it is indicative of your desire for professional improvement and to be a real service to the industry. So in whatever small way the Board can contribute to making this conference as successful as those of the past, it certainly wants to do it.

It is good that you are here again.

CHAIRMAN BLUMER: Thank you very much, Carl.

And I should like to welcome those of you whom I have not personally met and welcomed here to the conference. I hope you are well dug in by this time and if not that you will be by noon. I am sure there are some things that need straightening out, and I hope that this will be done before too long.

I should like to turn the floor command, then, over to our comrade and friend, Mr. Ken Franklin.

SECRETARY-TREASURER FRANKLIN: I should like to say, "Good morning" to those of you to whom I haven't had a chance to say it yet.

On your program you will see that we are scheduled for a roll call. In the past few years we have not done that at the beginning of the program, because some of the folks are coming in on morning trains.

As the conference grows from year to year there are new faces each year. We should like all of you to know each other; so some time this afternoon, when the group is completely assembled, we are going to ask you to stand and introduce yourselves around the table, as we did last year. So this morning we are going to dispense with the roll call.

Tom has mentioned that there may be some things that need straightening out. My main purpose in being here is to help you folks if you have any problems. If there is any difficulty with your reservations, etc., if you will see me I will either take care of it for you or send you to the person who can straighten it out. I hope we don't have any, but in a group this big mixups are possible.

When you registered this morning, of course, you received tickets to the Reciprocal Meat Conference banquet which will be held tomorrow night, and Mrs. Drinane, who registered you, also asked you if you were going to attend the National Live Stock and Meat Board annual meeting luncheons and banquet. In the interest of keeping records, we would urge you, if you do not know whether you are attending the banquet of the Meat Board don't take a ticket or if you have turn it in. If you are going to make up your mind later you can still get a ticket at the registration desk at the annual meeting. We need, because of the seating arrangements, an accurate record of those who are going to be there. So if you say you are going to be there today, please follow through on it. In that way you will have a reserved seat. If you are not quite sure, don't sign up today. Come to the meeting and, of course, you are welcome to attend the banquet. We should like to see all of you there, but we should like to know for sure that you are going to be there.

As in the past, we are recording the proceedings of this conference. We have asked that you send in your papers and, unfortunately, the response was somewhat less that 100 per cent - a great deal less than 100 per cent. If you have a typed copy of your manuscript with you, will you please announce that fact to our reporter, so that she need not take your words down?

The group is getting bigger and bigger. We hope that there is good, lively discussion. When you wish to enter the discussion, please stand and state your name clearly. This is a fairly large room. It is a little difficult to hear from the back of the room, and if you are going to say something we want to credit it to you. So, please, in all cases when you have discussion points give your name and rise.

It has been customary in the last two years to award the hard-working chairman of this conference something with which to pound, the only real memento he gets out of all the hard work he puts in. Tom, it is a great pleasure on behalf of the Board to give you this gavel. We hope that you won't have to use it. It is inscribed and we hope it will give you some memories of the conference. (Applause)

CHAIRMAN BLUMER: Thank you very much. I have a strong right arm, though, in case I have to use it.

SECRETARY-TREASURER FRANKLIN: One more anncuncement and then we can get on with the regular program. Those of you who were at the conference last year undoubtedly recall that the Board and the Conference inaugurated what was called the Reciprocal Meat Conference Award. It was given for signal service in the field of meats to four of your cohorts: Sleeter Bull, Ken Warner, J. B. Francioni and P. T. Ziegler. If you will recall, the award was in the form of a small shield plaque. Your Executive Committee, meeting to plan this year's program, came up with the suggestion that inasmuch as we would continue this award system, when it became appropriate, they felt that there should be something commemorating the fact that these awards had been made, something of a permanent nature. So we got together at the Board and we had made this large plaque which we are very happy to present to the conference.

It contains the names of the four men who have received the awards. As you can see, it has ample space to inscribe additional awards from year to year. It is our plan to display this at the conference and very proudly to display it in the offices of the Board throughout the year; so that these men who have been recognized by your group will be recognized throughout the year.

On behalf of the Board, Mr. Chairman, I present you with this for the conference. (Applause)

CHAIRMAN BLUMER: Thank you very much, Ken.

On behalf of the conference then I should like to express our appreciation to the Meat Board for making this plaque available. (Applause)

The plan for this conference with regard to committee presentations is for the committee chairmen to moderate their own programs. This is being done for the reason that several of the committee chairmen requested this privilege, so that they might make any introductory remarks they deem necessary in order more effectively to carry out their presentations. Also for the committee chairmen to sum up as the programs close if they so desire.

So then we will begin with our first committee presentation, which is the Extension and Consumer Education Committee, the chairman of which is C. E. Bell of the U. S. Department of Agriculture. Charley.

MR. C. E. BELL: Well, gentlemen, it is nice to get back down near the ground. I am on the twenty-eighth floor.

I should like first to introduce the members of our committee. As I call their names will they please stand? I want to see who is here.

If you will look at your program you will notice that the first one is John Christian of North Carolina State College. At the last minute John could not come and he expressed his regret.

We have Leon Orme from Michigan State University. Is he here? (Absent)

Bob Reddish from the University of Florida. (Applause)

Roy Snyder from Texas A. and M. (Absent)

Bob Havener from Ohio State University. (Applause)

Ellis Pierce from Cornell University. (Applause)

Bob Rust from Michigan State University. (Applause)

And Jim Reynolds from the University of Missouri. (Applause)

We have a little different type of presentation this morning than we had had. This will be in the form of a discussion among the panel members. We are doing this for several reasons. One is for a little change of pace. Another is we can keep within our time because we can cut this off when our time is up.

I think we have a good panel here which is not only geographically distributed,but it also has on it representatives who have different interests in meat extension work.

I am going to call their names now and to ask them to come forward.

Ellis Pierce from Cornell. He is doing a lot of work up there with producers - educational work.

We have Bob Reddish who kindly consented to pinchhit for John Christian at the last minute when he could not come.

Jim Reynolds, from Missouri, who is an old hand up here. He was up here last year.

Bob Rust who has been working on the retail end.

The subject is "The Development of an Effective Meats Extension Program." That is a large subject. It covers a lot of field. In the discussion we will get over as much of it as we can.

I should like to say first that in extension work there are a lot of people in other agencies who don't quite understand that we are not a straight-line agency. In other words, we are a cooperative extension service, and we have the help of the state land grant colleges, the state extension service, and the Federal extension service, all working together. We think it is a very effective way to work. It makes it easier for us to enter into a lot of fields and give guidance where it is needed. Of course, our primary job and the reason the extension service was set up was to work with and help rural people and to carry them information.

It is a two-way proposition. We also bring information from the field back to the research workers. Our job is to interpret research so that the people who use it can understand it. Also to help them in any way possible to put it into practice.

But I don't like to think of it as an extension program; we think of it as the people's program. The program is developed with the guidance of the people, based on their needs and their desires and requests. Of course, the job of the men on the firing line and others like them is to train these county agents so that they can do a better job with the people; and they sit down with the people in what we call program planning committees and they develope the type of program they think is needed in the area.

Mr. Ken Warner who is here today, last year, you will recall, gave a very able discussion on the history of the extension meats work, and he showed how it had changed down through the years. In the old days we spent most of our time with the farmers helping them with the home meat supply. Our activities were mainly centered around slaughtering, meat cutting, curing and canning, and later on freezing.

That has changed a lot. In fact, our field has broadened into a wide field. About the time of World War II the freezer locker plants came into being. You remember that they spread all over the country and the meat specialists were called on to give guidance. Then came the home freezers, and they had a new field to operate in, helping people to select and prepare meat for home freezers.

Well, the meat industry is continuing to change. The whole meat situation is different than it was, and so extension meats work has had to change to conform to it. To list just a few of the factors that brought about this change, one is the economic pressure that is on livestock producers. Livestock producers, I think, are thinking more about who uses their product and why they buy it, and how they can best meet those needs and the need for balancing production as we get into periods of overproduction and the increasing importance of animal proteins in the human diet. The relationship of the carcass quality and consumer demand to the producer's profits. Consumer resistance to fat meat. The self-help markets that have largely taken over the retail meat trade. New processing and merchandising methods. The wide use of home freezers. And many other things I could name have changed our meats extension work.

Recently in extension work we are getting over to the urban people. They are demanding service in the selection of meats, and so a lot of work is now being done in the cities where the meat is consumed. In fact, New York City is putting on a county agent, we had notice just the other day, to work with families and consumers.

The trend in meats extension work is toward specialization. However, it is a flexible type of program and it can be adapted to any situation.

We have one man on the panel here who has specialized in a certain field; others are trying to cover the whole field and that will be brought out in the discussion.

There is also a difference in the assignments of extension meats specialists to departments within the university itself. In some schools the meats specialist is in the animal husbandry department and in other schools he is in the agricultural economics department. Then we have quite a development

of food technology departments and in some schools he is assigned there. But regardless of the assignment the work in many respects is covering the same field.

Of course, in cooperative extension work we work with other agencies and other people, and naturally with the staff members in the other fields there is a very close relationship. Animal husbandry, home economics, nutrition, agricultural engineering, agricultural economics, entomology, veterinary and 4-H Clubs all have their place.

I think to get into this we will take up the various phases first and then try to pull them together. One phase which is of major importance today is consumer education. I am going to divide it up into consumer education, producer education, retailer education, the home meat supply, then working with processors and packers, and we will also get into the things which make the program more effective.

First I should like to ask the panel to discuss for just a minute the consumer preference studies -- a number of them have been made -- as to whether they are worth anything and what they do contribute to our meats program.

I think I will start off here with Jim Reynolds on my left. Jim, in Missouri you have done a lot of work on consumer studies. Could you tell us just briefly what they mean in the development of meats extension programs, how you use them, etc.?

MR. J. W. REYNOLDS: Thank you, Charley.

First of all, Charley, I appreciate recognition here that we have an effective extension program -- official recognition of it. In our consumer preference work in Missouri one thing we know for sure is that people don't want to buy fat. We know they don't want fat meat. We know they want lean meat. We still don't know some of the details of it. How lean they want it, how lean they will take it, how often they may change their minds.

The one thing we know is that they don't want fat meat. So that affects our extension program, of course, as to the type of information that we give and the objective we are striving for. I think that is the main thing I can say now.

MR. BELL: You have some studies on grade, too, haven't you, their preference as to grades?

MR. REYNOLDS: Yes. That has caused a little controversy up to this point in some places. I think we can just briefly say, Charley, that we have observed in extension as well as have our research folks that a lot of our consumers just don't know very much about grades of meat. Actually, in some cases they are not too familiar with the names of grades. Then, of course, following that is the application in a lot of cases. They just do not know too much about grades of meat or not nearly as much as we thought they did.

MR. BELL: Ellis Pierce, of New York, what is your thinking about consumer studies? Do people know enough about what they need or want to be of

any value, or is it mainly a matter of educating them as to what is best for them?

MR. E. A. PIERCE: Charley, thank you.

I think that lots of times we say that we cater to people's needs. You brought out very briefly or at least inferred that a lot of the consumers do not actually know what they need, and some times they need a little guided direction to stimulate the fact that they do need something. We have found in New York that when you devise a program that you think fits their needs you soon find, by golly, that is what they need, and when they find out that it is what they need then they start to cooperate.

But I should like to go back to the relationship between carcass grades and consumer studies. I think that an article came out from some area in Texas. I say some area because Texas is a large state and even O. D. probably does not get around to all of it. But I saw an article a while back that said that grades, especially the beef grades, instead of being a standard of comparison, are rapidly becoming a standard of pricing because prices are based on grades. And this has become of much greater importance since the OPS classifications in which everything is subjected to grading.

Everyone wants to buy by grade and is demanding grade; yet, as Jim brought out, many of our consumers do not know what grade means and many of them have little, if any, association between prime and subsequent quality of meat. We have found in New York State that as you go into the different areas the people have different conceptions of what grade means. So that any time we get a chance to talk grade and quality, using it across the board as a method of instruction, we like to do it.

But as far as the consumers' wants are concerned, they are quite varied in their backgrounds and in their ability to purchase and some times, as I said, you have to feel out their needs and then convince them that those are the needs that they actually have.

MR. BELL: That is very good, Ellis.

I want to ask Bob Rust a question now. What is the purpose of consumer education as you see it? I know that you have been working very largely with retailers and that you have come very close to this. Is it a matter of educating them on their needs, as Ellis brought out or of conforming to what they want?

MR. RUST: I would be inclined to agree with Ellis quite a bit. We are all quite familiar with the automobile industry in Michigan, and I think we almost have to take a page out of their book. I don't believe that anybody has, if I may use a term that comes out of the educational field, a need for a certain horsepower automobile; yet the manufacturers have created that type of need. I think our educational program for consumers should possibly be educating them as to what their needs actually are.

I think it is obvious to all of us that the consumer's knowledge of meat and meat products is extremely limited. With regard to some of our

consumer preferences, as we call them, it brings to mind an example of what happened to either Campbell's or Heinz's when they questioned consumers as to their preference for a catsup jar. All of them said that they preferred a wide mouth jar for catsup. When the product was put on the market it lasted only about a month because no one would buy it, I am told, in the unfamiliar container. Yet they said they preferred it. However, they would not buy it.

Some times I wonder whether our education should not be geared to catering to the consumer's likes as she expresses them but educating her as to the likes or desires that she should have.

MR. BELL: Fine! That brings us then to what we have to work with in this consumer education work. Bob Reddish, what are some of the things that you are doing along this line in the way of methods and technics of educating the consumers in Florida?

MR. R. L. REDDISH: We are just beginning a meats extension program. We plan to train the county agents and the home demonstration agents in the various counties and communities by means of workshops or clinics and then to go into those areas and help the county agents and the home demonstration agents to have schools, short courses of some kind, to educate the consumers. We found in some of the consumer preference studies that we made last fall that they are especially weak in selecting and buying meat. Yet on the other hand, as has been brought out here, they do have some good ideas in mind, because in our studies we found that they were selecting meat a great deal on the basis of the way it was trimmed and quite a bit on its freshness. Once the number of cuts in the case was few they no longer went through those cuts and stirred them up. They waited until the counter was replenished with fresh, bright cuts of meat.

That is about all I have to say.

MR. BELL: Have you been able to sell them on that Florida beef yet?

MR. REDDISH: On some of it. We do have a problem. One reason we conducted those studies was to find out what problems we had, so that we could do better work on them in front of the producer, the retailer, the processor and the consumer.

There is discrimination against Florida beef. It is for no good reason because the retailers sell Florida beef, the western beef, the eastern beef, and all the rest of it in the case, and some of them label it as western beef or eastern beef depending upon which will sell. But we are working on it.

MR. BELL: Ellis, what have you found in New York State to be the most effective way to reach consumers with the meats education program?

MR. PIERCE: Charley, I was going to pop up here if you had not asked me this question. I have found that through the normal channels of the agricultural extension service we have difficulty getting to the actual consumers, the reason for that being that most of our meat consumers are women and not very many of them show up at the agricultural meetings on beef or sheep or what

have you. So I have found that my best approach in New York State is to work through the Home Economics Division, because those gals are organized a little differently than we are in the agricultural extension service and they have their program planned years in advance and it is not an easy job to accomplish things immediately.

For about two years now George and I have been working with and visiting with the girls in Home Economics, and we are now starting to get channeled in, so to speak, so I think we are starting to get some results. The reason we use this type of approach is that they have leader training meetings. If you can get a program which is appealing to the executive committees in the counties -- of course, you have to feel your way along as to their needs and to encourage their needs and then get into these leader training meetings from where they extend the information back to the grass roots.

We find that that type of approach definitely reaches more consumers than any other method we have tried.

MR. BELL: Ellis has brought out a very good point. Of course, the time of the specialist is limited. He cannot do everything he wants to do, but he can work through the home agents and the county agents who in turn more and more are looking to local leaders to help them to reach more people.

Now, Jim Reynolds, to wind up this consumer education point, briefly just what would you say are the important subjects that we think of in terms of consumer education?

MR. REYNOLDS: Charley, I should like to give this one quick example from our work in Missouri. Of course, in Missouri our major source of farm income is livestock and our consumer education program then mainly is concerned with meat and meat education. We have eight consumer education officers now with ten marketing home economists which pretty well covers our state population-wise.

Now here is a girl who went into the St. Louis office, who had no technical knowledge whatever of meat. I think this is a good example of how we have worked with her and trained her since she has gone into the office and how well she does with the commodity, meat. She is Catherine Brent and a good example is her "Good Food Buys This Week" bulletin which I think is one of the best in the country. Most of you may have seen it. It gives you a little example of how she works with meat. Then, of course, she has television shows and other programs along with it on which she gives a lot of meat information. You can identify some of the Meat Board material here.

In addition to information on meat currently she talks a little about the outlook and gives general background information. Our trends in eating. She throws that at them once in a while. What the city family spend for their food and how they spend it. Frozen foods. Then to show that she works on something besides meat, there is a little on cheese. She is doing a good job, we think on that, and a good one on fruit.

But this is one of our strong points in consumer education, this weekly food marketing bulletin.

Some of us over there think at the present time we are at the point where we should reappraise our program on consumer education, it has expanded so rapidly, and, Charley, I think most of these folks know this program grew mainly out of the plentiful foods or the surplus foods that we had. The main objective, actually, in starting the consumer education program was to move the surplus foods.

I don't know whose fault this might be, but even the marketing home economists have the idea that a lot of their responsibility is to help the producers, in other words, to try to end up with the producer getting more dollars for his livestock, when actually their primary responsibility is, as the economists say, to maximize the general welfare of the consumers or of society, however you want to say it, and then all the other folks will get their share of that benefit.

That is just one example to illustrate how we are going to have to reappraise some of our thinking and some of our planning. We are going to have to do a little better planning as we go ahead and try to get things co-ordinated a little better.

MR. BELL: We could go on with this but we have some other phases here. We want to think about the producer because he was the first person we worked with. The producer, as I mentioned a minute ago, is becoming aware more and more of the economic influence which the consumer demand has on his product.

Bob Reddish, what are some of the problems that you have run into in Florida in producer education? I think that you have been working with the beef cattle and hog producers on this.

MR. REDDISH: One of the problems that we have, of course, is lack of the three high grades of beef, the three grades of beef, choice, good and standard. We have about a 70 or 75 per cent deficit in beef, about a 70 per cent deficit of lean high quality pork.

The next problem is that the producers in the state cannot very well produce choice beef on grass, hay and silage. So that means that we have to work with the producer and try to get him to produce a grade of beef that he can sell profitably and a grade of beef that the consumer will readily buy.

As to the pork situation, we don't have enough meat type hogs. Very little grain is grown in the state; so it is hard to convince the producer he should pay a high price for grain when, when he sells his pork, he gets no more for the better pork than he does for the kind that he has always been raising.

MR. BELL: Here we have one situation that can vary with the states, and the program has to be tailored or made for the situation. Yours is not enough of the quality meat and the quality feed?

MR. REDDISH: That is right.

MR. BELL: How are you attacking this problem?

MR. REDDISH: We are going into the beef part of it. We are organizing cattlemen's schools. We have organized about seven in the last two years and we have about that many tentatively planned for next year. We try to get two or three spots on the schools, which last from six to fourteen weeks and meet once a week. The producers attend these schools. They pay a registration fee and participate in the program.

We try to work in one, two or three topics on meat, such as grading, carcass grading, live grading, or some other phase of it to show them what they should produce. The next thing is to try to convince them that they can produce the kind that will sell profitably.

MR. BELL: This is an example of a meat specialist working with animal husbandry?

MR. REDDISH: Yes, sir, and people on the college staff. We work together on it jointly - nutritionists, entomologists, agronomists, agricultural engineers and everybody. We figure that by making it a varied program such as that we can get more farmers there, more producers, and that once we get them there the agriculturalists can work with them in these schools and we can work with the agents later on and help them with their personal problems, if we can get them there together as a group.

MR. BELL: Ellis Pierce, you have a little different situation in New York. Your hog numbers weren't too large, and you are starting on a program on a quality basis, I believe, and teaching the marketing of quality hogs. Can you tell us in a few minutes something about that, Ellis?

MR. PIERCE: This approach that we have hit upon in New York is based on the grade factor, and we have developed it around the use of price differentials for grades. Lowell Strong, who is sitting over there, was there the very first day we attempted this program. I might say to Lowell that since that time it has grown much faster and much greater than any of us ever anticipated it would grow. It is based on five grades. They are primarily the U.S.D.A. grades, and as the need has presented itself we have varied it somewhat. The reason we varied it was because within the U.S.D.A. grades, 1, 2, 3 and medium, you have a wide range of quality. So we have taken out a new grade on our own, our Empire select. That is our own terminology, and that grade we have reserved for those hogs which we definitely think of as being outstanding meat type hogs. Those are the hogs that command the highest price on our market.

I notice on our outline here, "Value of carcass data in promoting meat-type animals." We have found (and this goes back to the basic soundness of the farmer, the producer in the area) that if they can see where they will benefit by producing a more desirable animal which subsequently is going to go to the consumer, they are willing to make a change if they get paid sufficiently for it. We have a price differential of $1.65 per hundredweight between our Empire select grade and what we call our medium grade. No, excuse me, that is between our No. 3 grade. Then we have a price differential of $2.15 between the select and the medium grade. That is enough, we feel, to cause the producers to stop and think because, after all, on a 200-pound hog, $2.15 a hundred is $4.30 and that is money in their pockets. As one of the

producers brought out the other night in the meeting, when you get their hands in their pockets jiggling their money, then you can start operating with them and they will go along with you.

Another reason this program is operating is the fact that these producers do not become discouraged when they bring hogs in of a lower quality, say, grading 2 or 3 or down in the medium grade. We thought when we first started out that maybe the producers whose hogs were graded these lower quality would get discouraged and not cooperate on the program. Contrary to that we find that the producers who were bringing in the less desirable hogs, the overly fat No. 3 or the really thin shelly kind of medium hogs were not becoming discouraged, but instead they were going back home and talking it over among themselves and trying to find out where they could get better breeding stock.

I was at a meeting the other night, discussing this program that we have in operation, and the interest is great in some of the counties and a great many of the producers in those counties are striving for better breeding stock. Some of them have gone to the extent of selling off their entire sow herds or their gilt herds and are buying hogs that more closely resemble the meat type.

We feel that through this type of program we are changing the type of hog that is being produced in New York State, and also we are increasing the efficiency of the producer.

This program is a little unique. That is, we have a cooperative food marketing chain, the P. and C. Family Foods, Incorporated, that has been cooperating with us to the extent that it is buying the loins for sale through its markets, of some of these hogs which we produce. I was talking to the manager of the meat department of this chain the other day, and he told me that they have been able to make a price differential of approximately five cents per pound on the loins from these No. 1 hogs that are coming through and the loins from the average run of hogs that are shipped in by the midwestern packers.

A question that commonly comes up in these meetings is what is the value of the meat type hog with relation to the No. 2 or No. 3 hogs? That is a pretty difficult question to answer, because we do not have information on what we call the reflected values. In other words, these consumer preference studies have shown areas where you can sell good meaty pork chops for 10 cents a pound more than you can sell other pork chops in the same case. But when you are on a large quantity basis it is a little difficult to price your loins from your meat hogs 10 cents a pound higher than you do your No. 3. So we actually have no method of measuring the dollars and cents value between a meat type hog and a No. 3 hog. I think when we get information of that kind which we can take back to the producers and say that these meat type cut a loin $4\frac{1}{2}$ square inches in area as compared with the No. 3 which will cut 3 inches or slightly more than three, then we can come up with a more accurate and a more reliable figure. When we get that information then I say that we are prepared to take bold strides in promoting the meat type hogs. But as long as we are promoting meat type hogs with no differential in price for the consumer except on a pound basis, as is true in most markets, then we are going to have difficulty getting the program across on a nation-wide basis.

MR. BELL: Thank you, Ellis.

In summing this up, I think he has pointed out how he is working with the marketing specialist, the animal husbandryman, and also with the processor and the marketing agent on this program, which gives you an idea of the possibilities.

Bob Rust, you have been working on retailer education. Will you bring us up to date on the program? I know that you were on the program last year, but you may have some new developments since then in that field.

MR. RUST: I think that anyone who doubts the need for retailer information just has to go into any retail market and take a look at the meat counter and talk to the personnel behind the counter. This need is not confined only to the independent market. Some of the big national chains are probably as bad offenders as anyone in violating what we at least consider good merchandising practices.

I think that I have covered our program pretty thoroughly in previous meetings. It has not changed too much to date. I think over the past couple of years I have gotten a pretty good picture of what the retailers actually need. What they want might again be a little different.

I think that most of the retailers will come to a meeting if it is a clinic type meeting. They like to see showmanship. They like to see someone put on a cutting demonstration. They look at him. He is handy with the knife. That is fine. That makes them smile. They are happy. However, I think, getting down to the real basic need, it is in terms of information on the product which they are handling. The average retailer knows very little about meat as such, about any of its characteristics. He knows that it comes in the form of a carcass and that it will spoil if it is left in the case too long or if it gets too warm. That is about the limit of his knowledge. He roughly knows how to cut it. However, now many of the younger men coming into the meat departments are trained only with the use of a power saw. They don't actually cut meat. They mainly reduce it to smaller pieces. (Laughter) It is interesting to see what they come up with at times. If the power saw breaks down and they are forced to use a knife and a handsaw they are completely lost.

I think there is a need for basic information on meat products. Also I think there is a need among the independent retailers of information on actual business practices in meat departments, such subjects as pricing and displaying, advertising. Those various topics are generally not too well known by the average independent retailer. Unfortunately, the retailers who need this type of information are not the ones who show up at the educational type of meetings that we have. The ones who do show up are those who are already doing a good job and are looking for a few more ideas.

The chain stores are not too willing to participate in any educational program. They have somewhat of a smug reluctance to be educated, I think. They already know all there is to know; so why should they come to any of our meetings or why should we give them any information?

This boils down to the question first of all of how hard you should work to get these marginal retailers who are not interested or have this smug,

know-it-all attitude to attend your meetings. Also the chain store operators who apparently feel that they know everything there is to know anyway.

Those are a few of the problems.

We have had pretty fair success with the two-week short course for retailers. At least it has been successful with us. The last one ended up with one of the members of our staff in the hospital for a day and a half. I don't know whether you would have said it was a direct result of the short course or not.

It is a lot of work for the number of people involved. However, I think the results are somewhat gratifying. I think this last one pointed up a need which I had not realized before, and I think it is a need that some of the independent chains, as I like to call them, the smaller chains, are interested in fulfilling. That is a need for the training of former grocery and produce people who are now in the management field in the basic fundamentals of meat. We had a couple of men in from one of the midwestern chains who were primarily grocery men. They were promoted to store supervisors and were not familiar with meat operation. They were quite pleased with the type of educational program that we gave them which gave them basic information on meat which would help them as store supervisors. They were entirely unfamiliar with meats prior to the time that they became supervisors.

Those briefly are some of the things in retailer education. I am trying a few experiments now. I hope to get into the publication of some meat cutting bulletins to see how they work along with a set of slides which can be used in a demonstration type meeting. I hope that next year I can report on the results and interest in that field.

MR. BELL: Thank you, Bob.

Our time is about up. I want to say a word about the home meat supply which is still in the picture. In the South, of course, it is very important yet. However, we find that about 50 per cent of the rural farm families are buying their meat needs. I might call on Bob Reddish here a minute. What is the situation in home meats? How do you gear your extension program to face the new needs of the farm family and the city family in home meats supplies?

MR. REDDISH: Rather than going out and working in the counties, teaching the individual families to do a better job of processing, we have tried to improve the processing in the locker plants and the meat curing plants. We do not promote home slaughtering of beef. We have put on about 30 demonstrations in the last 18 months of hog slaughtering, beef cutting and pork cutting, and we are working with the locker plants, the meat curing plants, and the small processing plants to get them to do a better job for the rural and urban people. We feel that we can accomplish more that way, since we cannot reach each individual family.

Some meat is still being cured in curing plants. Quite a bit is still going to lockers. Also some meat is still being canned in community canning plants, but the amount is decreasing. Also there is still some home canning of meat in Florida, but it is decreasing. The home demonstration

agents and specialists have worked hard in that respect on meat canning, and with the locker plants on processing and freezing.

MR. BELL: Thank you, Bob.

John Christian has devoted a good deal of his time to the home meat supply and he is not here, but he wrote me saying: We are working with them in getting a better variety and to utilize specialty meats and different methods of purchasing, preparing, cutting, etc.

It is still in the picture although it is a little different, because, as I said before, they are buying a lot of their needs and the amount that they are putting up at home is relatively small now.

Now to sum this up, since our time is up, I should like to list some of the other agencies with which extension meats workers cooperate.

Of course, the National Live Stock and Meat Board. We are very grateful for the material which they furnish to help with the educational program, and you see by their attendance at meetings that they are very much interested in it.

Then producer organizations. We have many of them, the beef councils which have sprung up, the pork councils, and various organizations by which the producers are trying to promote their products. Of course, the meat specialists are asked to come in and get guidance and counsel there.

As to the markets, Ellis Pierce touched on how we work with the markets with gradings and demonstrations, furnishing carcass information on the animals which move through the packers and processors. But we work in the states with them to find out what the needs are and to carry information back to the producers that they need on the animals which go into the processing plants.

The freezer locker plants are still in the picture.

Also some of the meat curing plants.

Then, of course, the research agencies, state and federal. The American Meat Institute, industry, the chain food stores, and others.

So you see this is a varied program and in each state it is different. If we had a dozen men up here they would each have a different approach because their situation locally is different. But it is a flexible program and it is one which calls for working with everybody.

CHAIRMAN BLUMER: Thank you very much, Charley. Also your committee who did a swell job here on this discussion.

Now we are going to have a recess.

We have been criticized a good bit about this early recess but there are two reasons for having it. First of all, we would have to break up the next committee presentation in order to have the recess maybe at the more appropriate time, as some of you feel it should be, and I think that this early recess will probably delay a little the onset of sitter paralysis. So let's take a ten-minute recess and be back here promptly at ten minutes to ten.

(Recess)

CHAIRMAN BLUMER: Will you please take your seats?

Our committee report for this after-recess period is the Meat Processing Committee. The chairman is Dr. R. L. Henrickson. Since we met the last time, Bob, formerly of Missouri, is now at Oklahoma A. and M. College. Now I will turn the program over to Dr. Henrickson.

DR. R. L. HENRICKSON: Thank you, Tom.

The member of our committee who will not appear on the program is W. E. Townsend. He is not here. The rest of the members will appear on the program.

This topic of tenderness I think is of great interest to each of you. The committee feels that it is one that is quite interesting and that it is one that perhaps is quite timely, since quite a number of new developments have come forth in the past few years.

In planning the program it was suggested that we include some discussion on the evaluation of the various methods of measuring tenderness, and Dr. Schultz has consented to discuss these for us. So, without taking a great deal more time, Dr. Schultz, the Executive Committee has allowed us two hours for the presentation of this program. This means that we will have approximately 25 minutes for each of the speakers.

DR. H. W. SCHULTZ: You will notice that your program says this is to be "An Evaluation of the Methods of Measuring Tenderness." I suggested that title when I thought somebody else was going to do the job. So please change it. At least it is going to appear in print changed merely to "Mechanical Methods of Measuring Tenderness of Meat." That does not mean that I am going to avoid making some comments on the evaluation of these methods, but it is too laborious a task to get into an actual discussion of whether the instruments are doing a very good job or not.

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MECHANICAL METHODS OF MEASURING TENDERNESS OF MEAT

H. W. SCHULTZ

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Of all of the factors which constitute quality of meat, tenderness is without doubt the one which is outstanding in determining whether the meat is satisfactory or unsatisfactory when eaten. Tenderness also appears to be the quality factor which is most difficult to determine objectively.

In this paper an attempt will be made to summarize all, or nearly all, of the methods which have been reported in the literature with the hope that it will represent the present status in solving the problem of measuring tenderness. All of the methods which have been used have as their primary purpose the reflection of the experiences of a person chewing a piece of meat. Chewing a piece of meat involves the principles of cutting, shearing, tearing, grinding, and squeezing. Therefore, it may be recognized immediately that it is no simple matter to design an instrument which brings all of these principles to bear simultaneously, or in relation to one another as in chewing. Consequently, most of the instruments proposed are based upon only one of the principles.

There will be no attempt in this paper to evaluate the subjective or sensory methods or the histological and chemical methods used to measure or predict tenderness even though in some instances the results obtained with instruments have been related to the results with panels or other means by the various authors.

Since meat is not a homogeneous material, it should be noted that it is extremely difficult to evaluate or calibrate an instrument using samples of meat. In instances where a homogeneous material other than meat has been used to study the instrument itself, it is reasonable to expect that the results will not be as uniform when meat is tested. This immediately leads one to conclude that selection and number of the meat samples in experiments involving tenderness is extremely important.

Lehman's Mechanical Devices

Perhaps the earliest report of the use of mechanical means for determining the tenderness of meat is that of Lehman in 1907 (1). He used two devices, one of which determined the breaking strength of meat; the other was a determination of the force required to shear meat between two cutting edges.

The Warner-Bratzler Shear

In 1928, Warner (2) reported briefly to the American Society of Animal Production that a shearing device showing promise as a means of measuring tenderness of meat was under development. In 1932, Black, Warner, and Wilson (3) gave a more complete report of the use of the instrument in some extensive studies of beef from different classes and grades of animals. The authors

described this instrument as consisting "of a steel blade 1/32 of an inch thick, drilled with a hole slightly larger than the sample to be tested. The hole was made square instead of round to eliminate the sliding of the edges across the sample that would occur if a round hole was used. The cutting edge was milled square and then smoothed slightly to effect a standard, reproducible dullness."

"A sample of meat was cored out with a keen, steel tool 1 1/8 inches inside diameter, similar to a cork borer. The sample was placed in the perforation of the steel blade and the blade led through a narrow slit in a wooden miter box. A hand-driven screw pull was used to pull the blade through the meat, the force required being recorded by a spring-type, self-recording dynamometer. When the instrument is in operation, the load on the meat builds up to a maximum and the fracture of the sample is sudden and complete."

In cooperation with the U. S. Department of Agriculture, Bratzler (4) completed a Master of Science thesis at Kansas State College in 1932, in which he demonstrated the value of what has now become known as the Warner-Bratzler Shear as a means of measuring tenderness of meat.

The Warner-Bratzler Shear has been a popular instrument for measuring the shearing of meat. It has been modified by motorizing to insure a constant rate of pull on the blade and the blade now commonly used is triangular in shape. The dial dynamometer for measuring force in pounds and the use of the shearing principle have remained unchanged.

The Cutting Gage of Tressler, Birdseye, and Murray

In 1932, Tressler, Birdseye, and Murray (5) described an instrument which they had constructed to determine the pressure needed to cut or puncture pieces of meat. The instrument consisted simply of a Schrader tire-pressure gage having a blunt penetrating instrument inserted in it. The puncturing or cutting end of the instrument was described as being made of metal rod 2½ inches long and 5/16 inch in diameter. The end was symmetrically tapered to a cone about 3/8 inch in height and with an angle of 13 degrees. The point was rounded to have a radius of about 0.08 inches.

In using the cutting gage, as it was called, a sample of meat 3 inches square and 1 inch thick was clamped at its periphery. As the cutting instrument was pressed through the meat, it was free to perforate completely without obstruction. Eight readings were taken on each sample. The pressure gage was calibrated so that the readings could be converted to pounds.

In the second paper by Tressler and Murray (6), this cutting gage had been modified to be motor driven. Also, it was concluded that this instrument was not as satisfactory as the penetrometer described below.

The Penetrometer of Tressler, Birdseye, and Murray

In the same paper (5) in which the cutting gage (see above) was described, a penetrometer was also described. The latter was an instrument then in use in the New York Testing Laboratory for testing bituminous materials. When first used to test meat, a penetrating needle 1 3/8 inches long and 0.15

inches in diameter was used. The needle had a rounded point with a radius 0.07 inches.

The meat sample was held in a 1-inch deep container which was 1.5 inches in diameter and was covered with a plate having a 3/8 inch hole in the center. In the second paper (6) regarding this instrument, a modified sample container was described. It was a metal rectangular box with a telescoping top portion equipped with wing nuts on the side to tighten it firmly over the meat sample. The top had eight 3/8 inch holes through which the needle of the penetrometer was inserted.

In operating this penetrometer, the needle point was brought to rest in the vertical position on the top of the meat. A 255 gram weight was then placed over the needle and held for exactly fifteen seconds at which time a reading of the distance of penetration in millimeters was recorded. The distance of penetration was recorded on a dial geared to the movement of the needle.

The Child-Satorius Shear

In 1938, Satorius and Child (7) reported some tenderness measurements using an instrument which recorded the number of pounds force on a gage as shearing bars were pulled across a dull blade with a triangular opening through which the sample of meat was placed.

The Volodkevich Tenderness Instrument

Also in 1938, Volodkevich (8), working at the Institute of Refrigeration, University of Karlsruhe, Germany, described an instrument in which two metal wedges or artificial teeth were used. The meat sample was placed between the two wedges, one of which was stationary, the other being movable by mechanical means. The movement of the wedge was recorded on a revolving drum, thereby giving a continuous recording of the exertion of pressure on the meat sample. The slope or character of the curve and the area under the curve on the graph were used to interpret the tenderness characteristics of the sample.

Improvements in this instrument were reported by Krumbholz and Volodkevich in 1943 (9).

The Winkler Instrument

This instrument, reported by Winkler in 1939 (10), was similar in many respects to the Volodkevich instrument and measured the force as work expressed in unit thickness of sample. It also recorded curves which permitted analysis of the character of the sample by their shape or slope. The area under the curve was used in determining the work involved.

Motorized Christel Texturemeter

In 1955, Miyada and Tappel (11) described the use of a Christel Texturemeter modified by attachment of an electric motor and reduction gears. The total work and maximum shear force required to press shearing prongs through cylindrical samples of meat were recorded at two-second intervals and work

diagrams were obtained by plotting the recorded data in pounds of force as a function of distance measurements. Maximum shear readings were obtained by knowing the crest of the force-distance diagram. The area under the curve represented the total work involved. Studies with beeswax as a homogeneous sample indicated that this method has considerable promise.

The Food Grinder as a Tenderometer

In the same paper that the Motorized Christel Texturemeter was reported, Miyada and Tappel (11) gave results of studies in which a food grinder was used to measure tenderness. By wiring the motor of the grinder in series with an A. C. ammeter and recording the ampere readings at five-second intervals, it was possible to plot power consumption in watts as a function of time to represent the total energy expended in grinding the sample. Theoretically, it was stated, increased toughness of meat would produce a corresponding increase in current consumption by the grinder.

This method was also tested with wax and with meat samples of various sizes and shapes. Pieces of freeze-dried biceps femoris of beef were cut into samples approximately 1 x 1 x 3/8 inches, rehydrated, and pressure cooked in the studies reported. Work diagrams were obtained by grinding 150 to 170 grams of cooked beef.

Recording Strain-Gage Denture Tenderometer

Since all mechanical means for measuring tenderness of food are designed to simulate at least some of the components of chewing in the human mouth, it is not surprising that an attempt should be made to utilize complete artificial human dentures in an apparatus. Although Volodkevich (8) had used partial dentures in his instrument, it was not until 1955 that Proctor, Davison, Malecki, and Welch (12) reported construction of an apparatus which simulated the frequency of chewing cycles and the coordination of grinding and crushing motions of chewing and included means for measuring and recording these motions.

Briefly, the instrument consists of plastic dentures fastened to an articulator with simulated cheeks, lips, and tongue made from resilient plastic material to keep the food between the teeth. The upper movable dentures are actuated by a motorized special transmission device to give both vertical and lateral movements toward the firmly fixed lower denture. Strain gages of an electrical resistance type wired to a preamplifier and oscilloscope were used to record the strains resulting from the chewing action. The mechanism is so constructed that the frequency of chewing was 45 cycles per minute.

Tenderness of the food being measured was represented by the maximum deflection in millimeters from a zero line which can then be converted to force (pounds). In testing the instrument with a tension spring and also with a piece of firm sponge rubber, the range of error at 99.7% probability level was about 2% with the spring and 2.3% with the rubber. Tests with certain fruits, vegetables, and bread indicated the adaptability of the instrument. Relationships of readings obtained with the Christel Texturemeter and with the Strain-Gage denture Tenderometer showed that when first bite measurements were made with the latter, the relationship between the two

instruments is non-linear. Apparently there is a fundamental difference in the qualitative interpretation by the two instruments.

In a subsequent publication, Proctor, Davison, and Brody (13) reported alterations in the Strain-Gage Denture Tenderometer whereby force-penetration diagrams could be obtained. Characteristic diagrams for numerous foods including raw and broiled steak and sausages were reported.

It appears to the author that the Strain-Gage Denture Tenderometer offers an excellent opportunity for studying the chewing mechanism of the human and the results so far have illustrated the complexity of the mechanics of chewing and the variability of characteristics from one food to another. It probably also serves to illustrate that any instrument designed to perform only one function such as cutting, shearing, compression, or penetration does not give the complete picture of what is experienced when a food is chewed.

The Kramer Shear-Press

In 1951, Kramer, Aamlid, Guyer, and Rodgers (14) described a new instrument for measuring tenderness of fruits and vegetables. This instrument, the rugged construction of which distinguishes it from most other instruments, uses hydraulic pressure to force a series of metal plungers (plates) downward through product held in a metal box. Originally the pressure required to plunge through the material in the box was determined by measuring the pressure of the hydraulic fluid. More recently a Dillon mechanical pressure gage* has replaced the hydraulic pressure gage to give a wider range of pressure recordings. In either arrangement, the Shear-Press measures the maximum pressure required to force the plunger through the material.

In a recent refinement of this Shear-Press, called the Lee-Kramer Shear-Press, a sensitive dial mechanical pressure indicator which registers through a proving ring is placed between the hydraulically operated piston and the plunger plates, thus providing a more direct measure of force against the product being tested.

A still later modification by Decker (15) utilizes a transducer in conjunction with the Dillon mechanical pressure gage, which, when connected through an amplifier to a recording device, results in a continuous chart recording of pressure as the plunger plates traverse through the product. The recorder provides a pressure-time curve which can then be utilized to measure the total work required to penetrate the product.

A recent publication by Shannon, Marion, and Stadelman (16) presented results with poultry meat to show that there was a high correlation between Kramer Shear-Press values (maximum pounds of force per gram of sample, using one whole side of cooked breast) and panel evaluation by chewing (number of chews necessary prior to swallowing a 1 cm. cube of chicken). The samples of chicken tested in the Shear-Press were of such size that ten blades were forced through them.

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*W. C. Dillon, Inc., Van Nuys, California.

To the author's knowledge, the Shear-Press has not been reported to be used to measure tenderness of meat, but in our laboratories, we have had some success in using it with both cooked chicken and cooked beef. Samples were prepared by cutting cylinders one inch in diameter with a cork borer. The cylinders were then placed in a plastic $\frac{1}{4}$ inch thick die and sheared off with a sharp blade, thus making each sample exactly $\frac{1}{4}$ inch thick and one inch in diameter. The samples were placed in the bottom of the test cell box and the Shear-Press operated so that plunger plates pushed through the sample. The maximum force in pounds per square inch was recorded for each sample.

Although we have made some efforts to determine the precision of the instrument, we have not been successful in obtaining adequate data to compare results with other tenderness measuring devices. One would expect, however, that the Shear-Press would have mechanical advantages over the Warner-Bratzler Shear and most other instruments.

We have made an effort to adapt the design of the cutting blade of the Warner-Bratzler Shear to the Kramer Shear-Press. However, this has not been perfected.

Discussion

Of all of the instruments for measuring tenderness reviewed here, the Warner-Bratzler Shear has been by far the most widely used in estimating tenderness of meat. It has become what might be termed standard laboratory equipment where tenderness of meat is to be measured objectively. Whether or not it can be easily replaced by another instrument would be simply conjecture.

There is little doubt that the Warner-Bratzler Shear can be improved upon mechanically to reduce experimental error. At least one study, by Hurwicz and Tischer (17), has been conducted recently to show that the variation observed in the experimental results can be ascribed primarily to the apparatus. These authors determined the maximum shear force, the total time necessary for failure in shear, and the slope of the shear force versus time curve for parawax and beeswax and various combinations of these two homogeneous materials. They came to the conclusion that the slope of the shear force versus time curve displayed the smallest coefficient of variation (4.79% vs. 7.41% for maximum shear force).

The Kramer Shear-Press, with all of its modifications shows promise as an instrument for measuring tenderness of meat and warrants further careful study.

Conclusions

1. Of all of the several instruments which have been suggested for use in determining the tenderness of meat, the Warner-Bratzler Shear appears to have been the instrument of choice.

2. There is a great need for studies of instruments themselves to help solve the problem of objective determination of tenderness.

3. Further intensive study of the mechanics of chewing is needed.

4. It is highly desirable to have extensive rheological studies of meat.

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DR. HENRICKSON: Thank you, Harold, for those very important and interesting remarks. I wonder, are you planning to carry on the study of evaluating these various instruments?

DR. SCHULTZ: Yes, as a matter of fact, we have a number of measurements which I might have reported, but they are so preliminary I preferred not to do it. We rather favor the meat grinder type, but we want to compare the results there with the results with the Kramer shear and also with the Warner-Bratzler and the organoleptic. In each instance we have comparisons with the organoleptic measurements.

DR. HENRICKSON: Before we move into the next topic I should like to know if Bruce Morgan is here. I overlooked him. He was very much on the committee that planned this program and he made a number of suggestions.

I am sure that you will have some questions as we move on through the program. I should like to ask you to jot them down so that during the discussion period, which will be led by Dr. Hiner, we can bring them up.

Now we have heard about the mechanical means of measuring tenderness. We have asked Dr. Deatherage if he would take the chemical approach. We have overburdened him just a little by asking him to appear this morning and then this afternoon, but I feel confident that he will have some good information for us. Dr. Deatherage on "Basic Chemical Considerations."

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BASIC CHEMICAL CONSIDERATIONS REGARDING THE TENDERNESS OF MEAT

F. E. DEATHERAGE

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Perhaps a place to start in a discussion of the basic chemical considerations on the subject of beef tenderness would be to make a few generalizations based on about 15 years' work in this field. First, there is little evidence to indicate that classical proximate analyses of chemical entities can give us a direct measurement of tenderness. The reasons for this are that meat is a biological system and gets much of its character through the organization of the various constituents. Second, any approach to the study of tenderness requires that all methods give reproducible and accurate results. Since all data comes from biological systems, it is necessary to know the magnitude of errors for all data and at the same time it is necessary to use sufficient numbers of samples or animals in order to assure valid conclusions. Perhaps this is a trite statement, but the literature on foods and particularly on meats contains much opinion mixed in facts. Thirdly, any attempt to study beef tenderness must take into consideration not only the animal itself, and the post mortem changes which may take place in the meat, but also must include changes which take place during processing and particularly during cooking. After all tenderness is a quality of cooked meat and not raw meat, and it is this quality which dictates consumer acceptability.

It is impossible in this short time to give you in any detail the thinking which has gone into our program. I will, however, attempt to give you the core of our work as it has developed. Perhaps it is well to start with a panorama of data showing the tenderness values of 500 different animals, some of which have been aged and some not. The first slide will show the relation between the tenderness value and the error of each determination. These data were obtained by a panel technique which we have demonstrated at this Conference before. Please note that the errors show a minimal effect in the center of the tenderness scale. This may be interpreted to mean that tenderness is a function of more than one substance, or rather tenderness may be considered a discontinuous or non-linear function. The second slide shows the tenderizing effect of approximately 85 carcasses which have been aged. You will note that even in aged meat there is some tough meat and also in the unaged group there is also tender meat. This slide shows the relationship of tenderness of aged meat of four different carcasses. Observe that two show a toughening effect with age. This is well beyond the realm of experimental error, so you see this quality is a very complex system. The next slide shows a composite group of cattle and the changes in tenderness with post mortem age. Notice the plateau effect at the two-three week level. The next slide will show a group of tenderness-time curves which we reported some years ago. You will see the plateau effect has gradually moved over towards zero time as the temperature has increased. The three curves represent aging at 33-35 degrees and so-called high temperature aging at 68, which has been preceded by a 24-hour chill, and the third curve represents tenderization without the so-called hot chill. I believe you can see from these curves that there is so much one can do by aging and not much more.

It has classically been considered that connective tissue is the cause for tough meat. This is perhaps true for wide ranges in market quality and physiological age of the live animal. We have evidence that this is so, but it is extremely difficult to get controlled experimentation on this point, for those doing research in production are not particularly interested in back-tracking, even though such may be necessary to do a complete job of meat research.

It has often been said that marbling is a mark of tenderness. I can only say here that in any of our work over the past 15 years we have not found this to be so. Marbling is largely a characteristic of sex and feeding management. What, then, does marbling do? This is a curve taken from the work of Dr. Hankins and his co-workers which shows that fat is related to the quality of juiciness up to a point, and beyond which additional fat is of no consequence. In fact I might say that consumers rebel against too much fat.

Connective tissue accounts for a relatively small part of meat. Could it be that the muscle plasma proteins could be one of the major contributing factors to quality as well as connective tissue? After all, when meat is cooked muscle plasma proteins form a fibrous mass. Projecting now to the process of post mortem tenderization, let us take a look at the possibility of proteolysis. It would seem strange that if such enzyme action were the cause of natural tenderization that this plateau effect that we have seen previously should not occur. On several occasions we have done experiments to determine if proteolysis did occur. The next slide shows classical protein fractionations of meat on post mortem aging. I believe we would have to agree that there is very little proteolysis taking place up to 13 days. Let us give some attention to the muscle plasma protein. Skeletal muscle is capable of contracting and relaxing, and this is brought about by the reaction of actin and myosin to form a high molecular weight protein, actomyosin. During normal contraction this reaction goes back and forth and is brought about by certain ions going on and off the protein surface. Could it be that actomyosin, which is formed during rigor mortis, was the key to beef tenderness? This slide shows that there appears to be some relation. The data on percent nitrogen extracted by a special buffer is an inverse function of the actomyosin of muscle. You will note that there is a fairly good correlation between the actomyosin and tenderness. If this is so, then post mortem tenderization might be related to actomyosin in two days. Could the resolution of rigor mortis be a dissociation of actomyosin into actin and myosin, or could it be that there are some changes taking place in actomyosin itself? This slide shows the formation of actin during rigor mortis. It also shows that actomyosin does not dissociate during post mortem tenderization. We then have to look into other directions. One of these might be the water-holding capacity of the muscle proteins. We all appreciate that on cooking juice is expressed. We would also expect that if proteolysis were extensive that the amount of juice expressed would increase with post mortem age. This next slide shows that the juice expressed on cooking actually decreased on post mortem aging and that the amount of juice expressed was related to tenderness. In other words, on cooking the proteins of aged beef actually hold more water than on unaged beef. Hence the coagulum is less dense and more tender. The next slide shows the changes in pH with post mortem age and the release of juice on cooking. Although only two animals are shown here, this same general trend has been confirmed in more than a hundred cases. pH tends to go up and juice expressed on cooking goes down.

What could cause these changes? It is known that pH change alone might cause it, but what causes the change in pH? Could it be that the randomization of ions during post mortem aging does in fact promote the water-holding capacity of meat proteins? This slide shows the total amount of sodium, potassium, calcium and magnesium in meat. This slide shows that the amount of extractable calcium in the raw meat and the amount of calcium in the juice expressed on cooking increase with post mortem age. The next slide shows similar data for magnesium. Notice the rapid change with the onset of rigor mortis. The next slide shows changes with magnesium plus potassium and sodium. The next slide shows changes in potassium. The next slide shows the post mortem changes in magnesium expressed in terms of juice and in terms of total nitrogen. Notice that the changes which are taking place reach a plateau which coincides with the plateau of the tenderess curves. This slide shows just the composite values for the other ions. Let us now take a look at the changes in these ions with post mortem aging. This slide shows the amount of each which may be extracted with water from the raw meat with post mortem aging. Notice that sodium is going off the protein into the water, potassium is going on to the protein, calcium is going off the protein and the net shift is in the negative charge in the water extract which means a positive charge change on the protein. This, of course, means that the protein is holding more water. This shows the same kind of data for the juice on the cooked meat. Notice that the changes are similar but even greater in order of magnitude. Thus the more tender meat has a higher positive charge and thus holds more water, making the coagulum softer and more tender. I should say that even though these changes reflect primarily muscle plasma, they would also profoundly affect the water-holding capacity of connective tissue. Whether or not such changes in connective tissue could cause tenderness has not been determined.

Let us now turn a little bit of attention to the chemistry of the cooking process. We have reported earlier that salt can produce profound changes when infused into meat in such a way as to improve tenderness, water-holding capacity, drip on freezing, etc. The next slide shows the pH changes with temperature on cooking. Notice the rapid changes which take place in the very critical 40-70° range. Note also that salt decreases markedly the juice expressed on cooking. Note also that the water-holding capacity does not markedly change beyond 70°. This next slide we feel is very highly significant and may open the door to better understanding of meat problems. Notice the irregular shape of the curves of juice expressed with cooking temperature. Note that very dramatic changes are taking place in the 50-65° range. There is considerable evidence which I cannot go into at this time that this S-shaped affair is a function of actomyosin content of meat and may be related also to physiological age. Note also that as the temperature approaches the boiling point more and more juice is expressed and I think you will all agree that this is the range which makes meat tough. Note also the effect of adding water and salt. Salt increases the water-holding capacity of meat over the entire range. The next slide will show changes in sodium and potassium with heating. Note the irregular curves in the 50-65° range. The next slide shows similar data for juice expressed. The next two slides show the changes of heating and added salt on calcium and magnesium in both the meat proteins and the juice.

I will conclude by simply showing the effect of certain other salts on the water-holding capacity of meat proteins. Notice the effect of increasing water-holding capacity by magnesium and even calcium.

I have not had time to explore with you the effect of water-holding capacity on other quality attributes of meat. I believe we must agree that water-holding capacity has an effect on tenderness. It also has an effect on drip on freezing, shrink on cooking and perhaps other changes found in the processing of meat.

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DR. HENRICKSON: Thank you, Fred, for this very important insight into the chemical aspect of why some meat is tender and some is less tender. I think that you have opened many avenues or many interesting facets of research for those who are interested in a master or a Ph.D. problem.

Our next speaker is one whom you are all acquainted with. However, I understand from him that he is soon going to become a professor at Loyola University and will be working in the department of anatomy.

At this time it gives me a great deal of pleasure to present Harry Wang, who will speak on the histological and enzymatic aspects of tenderization.

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BEEF TENDERIZATION: HISTOLOGICAL AND ENZYMATIC ASPECTS

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I am happy to have this opportunity to discuss with you the work on enzymatic tenderization which, for the past two years, has been actively pursued by the Divisions of Home Economics and Histology at the American Meat Institute Foundation (1, 2). The objective of this work is three-fold: (a) to analyze the action of commercially available enzyme preparations on the structure of muscle tissue components; (b) to screen and test these enzyme preparations on beef steaks, thereby evaluating the organoleptic characteristics of the treated steaks, especially tenderness, and (c) to develop a better understanding of the physical basis of tenderness. Time will only permit my presenting a summary of results at this time.

To date, more than a dozen enzyme preparations have been appraised with a number of histological techniques. The relative potencies of these preparations on each of the principal muscle tissue components are presented in Table 1. (Slide 1) On the basis of specific structural changes, to be presently described and illustrated, they can be conveniently divided into three groups. Such a classification bears some relationship to the origin of the enzymes -- a fact, which may be significant. The first group comprises those that are derived from either bacteria or fungi. With few exceptions, they act primarily on the muscle fibers. Most of them attack and dissolve the sarcolemma first, then progressively degrade the actomyosin, leading to complete disappearance of the cross-striations. Eventually, the bare fibers would merge or fuse with neighboring fibers especially if preceded by a swelling as they often are. These changes are also accompanied by a progressive decrease in the extensibility of the fibers. The latter is a physical property of muscle fibers, which has been shown to be inversely related to tenderness (3). (Slides 2 and 3) The sarcolemma (4) is important in tenderness consideration because this structure, as the outer limiting membrane of every muscle fiber, is not visibly altered in any way during either aging or cooking. Consequently, due to its great combined amount in meat, it is believed to work against tenderness. (Slides 4 and 5)

The second group of preparations have to do with the connective tissues (5, 6) and they all come from tropical plants: papain from the Papaya melon; bromelin from pineapple; ficin from the fig, Ficus. These three are characterized by their strong action on the connective tissues, although they also attack the muscle fiber protein to a varying degree (Table 1). Their action on collagen and elastin has been separately investigated.

Enzymatic action on collagen is appraised by virtue of its strong staining capacity with acid fuchsin. Raw undenatured collagen, consisting of bundles of collagenous fibers bound together by a ground substance (7), stains

a deep red with acid fuchsin. Collagenase activity which is common to papain, ficin or bromelin, first disintegrates this ground substance, then alters the structure of collagen in such a way as to appreciably decrease its affinity with acid fuchsin. The liberation of the ground substance releases the bundles of collagenous fibers, whereupon the individual fibers of collagen begin to lose their originally very discrete fibral nature. At this stage, the collagen is rendered blurred and undefined, taking only a pink or even yellowish color from the Van Gieson's mixture. (Slide 6) On the basis of these manifestations, ficin and bromelin are equally strong in their collagenase activity while papain is considerably weaker than either of them. (Slides 7 and 8)

It is well known that collagen undergoes hydrolysis upon cooking, i. e., a part of it becomes gelatinized or granulated under heat. Collagen that has been treated with papain, ficin, or bromelin yields a greater amount of hydrolysis than collagen not previously treated with any enzyme. (Slide 9) This is due to the fact that the enzyme activity is tremendously stepped up at the elevated temperature incurred during the cooking period. On the other hand, the activity of these enzymes even at very high concentrations seldom goes as far as hydrolyzing the collagen at room temperatures. And this is true of both raw collagen and collagen in cooked meat not previously treated with an enzyme. (Slide 10) This is an important fact to keep in mind when considering whether an enzyme should be added to meat in its raw or cooked state. In other words, the combined effect of enzymic action and cooking cannot be duplicated in ready-cooked meat merely by increasing the enzyme concentration. A possible reason for this is that raw and cooked collagenous tissue might react differently toward the same enzyme.

Elastic tissue, like the sarcolemma, is not structurally affected by either aging or cooking. For this reason plus the fact that muscles which need tenderization most contain large amounts of elastin, serious consideration must therefore be given to it. Our results on elastic digestion are based on the staining of elastic fibers with Weigert's stain. This stain dyes native elastic fibers a total black or dark blue. (Slide 11) The action of elastase consists of first, as in the case of collagenase, a general decrease in the staining capacity of the affected fibers. Then it goes on actually breaking or eroding the fibers into segments (8). Thus, partially digested elastic fibers appear as broken lines. (Slides 12, 13 and 14) Continued elastase activity will dissolve the elastin almost completely, leaving behind only their "ghosts" to mark the site of their previous existence. (Slide 15) In this respect, ficin again is the strongest, papain next, and bromelin being the weakest of the three.

None of the enzyme preparations derived from either bacteria or fungi has any elastase activity. The only other preparations that were found to possess some similar activity besides the three enzymes from tropical plants are trypsin and viokase both of which are pancreatic preparations. (Slide 16) Since the mode of attack on the elastic fibers is the same in all of them, it is assumed that the active principle involved is the enzyme elastase and that the observed differences in the degree of activity probably reflects the amount of elastase present in each of them. pH and other important factors in elastolysis will be considered elsewhere.

Next, I have three slides to demonstrate the value of histological criteria in evaluating enzymic potencies of a preparation. The slides, of

course, do not reveal as much as one sees under the microscope; nevertheless, I hope they will give you some idea as to how the values in Table 1 were arrived at. (Slide 1) The slides are celloidin sections of freeze-dehydrated beef treated with ficin, papain or bromelin and stained in exactly the same manner. The first of these is that of ficin: (Slide 17) note the extensive elastin digestion and collagen degradation plus considerable effect on the muscle fibers. The second slide is that of papain (Slide 18): the muscle fibers were affected to about the same degree as by ficin, but there was definitely less action on collagen and elastin. Only careful inspection might reveal the beginning of some elastase activity on some of the elastice fibers. Now look at the last slide, that of bromelin (Slide 19). It shows very little evidence of muscle fiber disintregation and very weak elastolysis, but collagen has been degraded to a degree comparable to that by ficin. These structural criteria have been confirmed on isolated muscle tissue components treated with the same enzyme preparations.

In a practical sense, none of the preparations studied is chemically pure. In fact, we might say that overlapping of action is the rule rather than the exception. It would be reasonable to assume that since an increase in tenderness may conceivably result from an appropriate degree of structural degradation of one or more of the muscle tissue components, any of these preparations may be expected to do a job of tenderization provided two conditions can be satisfactorily met. They are undoubtedly good penetration of the enzyme into the tissue and correct amount of the enzyme to be used. In this work we are fortunate that no problem of penetration was encountered, since the enzymes were dissolved in the rehydrating solution for the freeze-dehydrated steaks. Under the leadership of my able colleague, Dr. Edith Weir, much screening and taste panel analyses were conducted to establish the conditions under which desirable tenderization can be obtained. Some of the enzyme preparations have been tested and found to be capable of increasing the tenderness of treated steaks 1 to 3 units on a scale of 10. Approximately, 0.01 - 0.03% of Rhozyme or fungal amylase, or 0.0001 - 0.0002% of ficin, papain or bromelin represent a range that will successfully tenderize U. S. utility grade freeze-dehydrated rib-eye (Longissimus dorsi) steaks. To achieve the same in the round (Semitendinosus) steaks, some increase in the concentration of these same enzyme preparations was required. Also, the tropical plant enzymes were more effective in tenderizing the round than the rib-eye steaks. Furthermore, the amount of residue, which consists mostly of undigested connective tissue, and which the panel judges invariably detect, shows an inverse relationship to the amount of ficin, bromelin or papain used. The amount would be greatest if the enzyme used is not one of these three, but one of the microbial enzymes, e. g., Rhozyme or fungal amylase. These findings are significant because they are exactly as would be expected on the basis of the differences in the proportion of the muscle fibers and connective tissues in the two muscles.

An important point with regard to the type of correlation we have obtained between histological and organoleptic data should be clarified. Throughout this work two distinct levels of enzyme concentrations have been used: one for histological manifestation, the other for organoleptic evaluation. These two levels are roughly 100: 1 for some enzymes (i.e., most of the microbial ones) and 10,000: 1 for others (e.g., ficin, papain and bromelin). Muscle tissues treated at the organoleptic level, even after

cooking, seldom show any structural changes; whereas, on the other hand, steaks treated above the proper organoleptic level would be either mushy or crumbly, indicating over-action of the enzyme. This, of course, does not mean a lack of correlation between our structural and organoleptic results. What it probably means is that there is a differential sensitivity of the organoleptic and structural criteria of tenderness. Obviously, the former is the more sensitive of the two. Desirable changes in tenderness presumably occur at levels much below those which are required for visible signs of structural degradation.

In conclusion, the results just presented have demonstrated the adequacy of the histological approach to problems of meat tenderization and also the feasibility of enzymatic tenderization as a means for improving less tender or low grade meat. A better understanding of the nature of tenderness has also resulted from the work. However, up to this point our work can hardly be considered as having more than laid down the groundwork of this new frontier of research. There is yet a long way to go before greater success can be obtained. Future problems seem to lie within three general areas. First of all, the problem of effectively introducing enzymes into raw meat must be satisfactorily solved. Secondly, there are problems encountered in screening of enzyme concentrations. These include difficulties arising from variability in sampling such as variations due to carcass and muscle differences, variations due to positional or level differences within a muscle or even within the same sample. All this would mean a great deal of screening and testing in the Home Economics laboratory yet needed to further substantiate the findings. Thirdly, there is great need for purifying the crude enzyme preparations and standardizing their activity in terms of universally acceptable chemically assayed units. I am glad to report that the Foundation will soon devote adequate attention to this important phase of tenderization work and will even look into basic factors, other than enzymatic in nature, but pertaining more to the physico-chemical properties of the muscle tissue components that may be directly or indirectly conducive to tenderness.

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Table 1.

RELATIVE POTENCIES OF TWELVE ENZYME PREPARATIONS ON THE MUSCLE TISSUE COMPONENTS BASED ON STRUCTURAL MANIFESTATION

Enzyme Preparations	pH	Muscle Fibers	Connective Tissue Fibers	
		Actomyosin	Collagen	Elastin
Protease 15	6.4	+++	-	-
Rhozyme P-11	6.8	++	-	-
Phozyme A-4	7.3	++	-	-
HT Proteolytic	6.9	++++	trace	-
Fungal amylase	7.1	+++	trace	-
Hydralase D	7.4	+++	trace	-
Hydralase TP	6.9	++	trace	-
Ficin	5.2	+++	+++	++++
Papain	5.1	++	+	++
Bromelin	6.3	trace	+++	+
Trypsin	5.7	++	+	+
Viokase	5.8	+++*	+	+

* Sarcolemma not affected.

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DR. HENRICKSON: Thank you, Harry, for this interesting report.

I think, too, that this has been a great stepping stone to learning more about the natural enzyme systems that are in meat. This will certainly lead us into an area of work.

The next portion of our program is that which concerns changes in meat during aging. We have divided this into two portions. The first is to be covered by Mr. Sleeth, of the University of Missouri, aging at low temperature. I might add that Mr. Sleeth is completing his Ph.D. in this area, and he has done some work in the high temperature area as well. Mr. Sleeth. (Applause)

MR. R. B. SLEETH: Thank you, Bob.

I hope that my following these three distinguished gentlemen does not lead you astray like the nearsighted heifer that got a bum steer.

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LOW TEMPERATURE AGING OF BEEF

R. B. SLEETH

UNIVERSITY OF MISSOURI

Over the years we have become more and more concerned with tenderness in beef. I think that our increasing awareness of the problem has arisen first because we have become more and more concerned with the consumer acceptance of beef, and secondly because many cuts of beef are considered convenience items (to be cooked and served with a minimum of time and effort). Therefore, there is little wonder that workers in this field of research should be interested in the factors that produce tender beef.

Since the consumer demands tenderness as well as other palatability factors in meat, improvement in the quality of beef through aging is a long-established practice in the meat industry. However, the problem of aging and tenderizing meat properly and economically with the least possible amount of shrinkage and cutting loss continues to be paramount importance to the meat packer.

It has been established that during the ripening of beef held at refrigerated temperatures, certain changes take place; among these is an increase in tenderness. Numerous investigators have shown that there is a change in the degree of tenderness as assessed by organoleptic evaluations and mechanical shear force measurements. Much work has been reported on this subject but no attempt will be made here to review the literature.

This report is a summary of some of the results obtained from a two year study involving 46 Choice and Good grade beef carcasses. The study was concerned with an investigation of (1) weight losses due to shrinkage as influenced by (a) length of aging, (b) quality of product, (c) temperature, (d) humidity, and (e) air velocity and (2) organoleptic characteristics of steaks stored at 0°F. for 0 months.

Experimental Procedure

The cattle, weighing 800-850 pounds, were slaughtered at the Missouri Station Laboratory. Hot carcass weights were recorded at time of slaughter. Carcasses were then placed in a chill room at 36°F. and chilled 24 hours to an internal temperature of 45°F. After the initial chilling period, the carcasses were weighed, quartered and/or cut into wholesale cuts, and then reweighed. Weight was recorded daily throughout the aging periods to determine shrinkage losses.

The aging room conditions for all tests in this study are shown in Table 1. The details of the aging, sampling, organoleptic, and Warner-Bratzler Shear procedures are given in an earlier report of this study (Food Technology, 1957, XI, No. 4, pages 205-208).

Results and Discussion

Shrinkage. From the physical standpoint, the over-all shrinkage picture appears to be based on the relative humidity of the aging room, the grade of cattle, and the length of the aging period. However, the majority of the moisture loss does not occur during the first two or three days as has often been suspected. The average shrinkage was 0.4 per cent per day indicating that a consistent line relationship is formulated under these cooler conditions. The data also indicate that, on the basis of days aged, the average per cent shrinkage per day for Choice and Good quarters and wholesale cuts aged in an 80 per cent relative humidity was 0.52 per cent. At 90 per cent relative humidity, the shrink was 0.32 per cent per day. This denotes that with a higher relative humidity in the aging room the moisture loss is substantially reduced.

Choice fore and hind quarters shrank less than those of comparable weight in the Good grade. These were aged under the same relative humidity. This reveals the influence of the subcutaneous fat on the moisture losses and should be considered by the meat packer or processor when aging meat.

In addition, all Choice and Good forequarters lost more moisture than the corresponding hindquarters which were held under comparable aging conditions. This is only natural since there is a much larger exposed cut surface on the forequarters.

In order to evaluate our experimental shrinkage data with a commercial aging operation, shrinkage data for hindquarters, forequarters, ribs, and loins were collected from the warehouse facilities of a major supermarket operator. The data was collected for a one year period (February 5, 1955 to January 28, 1956) which included 16,974,450 pounds of product.

All meat aged was U. S. Choice and was aged under the same environmental conditions; namely, a temperature of 33 - 35°F. a 88-92 per cent relative humidity and an air flow of 15 to 20 lineal feet per minute at the surface of the product. The wholesale loins were aged an average of 18-21 days, wholesale ribs and hindquarters 15-18 days, and forequarters 5-7 days.

The average shrinkage for the hindquarters was 1.9 per cent as compared to 3.0 per cent shrinkage for our data. However, a valid comparison cannot be made here due to a very small number in the experimental group.

The per cent shrinkage for the forequarters was 0.5. No comparison is possible with our data since we did not age any forequarters comparable to the commercial aging period.

The average shrinkage for the Choice wholesale ribs was 2.3 per cent for the 15 to 18 day period. Our data, indicates a 4.0 per cent shrinkage was found for Good wholesale ribs aged 12 days under the same environmental conditions.

The wholesale loins had an average shrinkage of 0.3 per cent. The variation in shrinkage from week to week was much less for the loins than was shown for the fore and hindquarters and wholesale ribs. A portion of this fluctuation was due to a shortening of the aging period at certain periods of

the year. The remaining variation was possibly due to slight changes in the environmental aging conditions although that was not ascertained.

Tenderness. There was a pronounced, although not significant, difference in tenderness in regard to days and temperatures at which the product was aged. You will note from the slide that in each instance as the days and temperature increased, tenderness values were substantially increased. In addition, the rib steaks were always more tender than the round steaks which were aged under the same environmental conditions. However, the round steaks from the Choice hindquarters aged 3 days were more tender than the corresponding rib steaks. This would lead us to postulate that top round steaks, during short periods of aging at low temperatures may be very acceptable to the consumer.

Evaluation of the tenderness values show no apparent differences between the Choice and Good grades in this test. These results are in agreement with two earlier reports by Wierbicki from the Ohio Station.

Flavor. The mean panel scores for flavor show very little difference in relation to days aged. This would suggest that aging periods longer than 14 days would not materially influence the flavor constituents normally developed in meat during aging. We also know that flavor is directly related to protein degeneration; therefore, a relationship may be associated with tenderness. During the aging period, the muscle fibers and connective tissues are attacked by both enzyme systems and chemical compounds inherent with the meat. The resultant autolysis has been considered to be a flavor more desired in meat.

There was no difference in flavor as shown by the palatibility committee between the Choice and Good grades of ribs and quarters. This is in agreement with Black et al. and Hedrick who found that fatness of the animal did not have any significant influences on the flavor of cooked samples.

Aroma. The mean scores for aroma follow almost directly with those for flavor in which there was no significance. The aroma would naturally be associated with flavor and the new chemical compounds which have been formed from the protein degradation.

Grade did not have any significant influence on aroma. This is in agreement with Marion et al. who found no apparent difference in aroma of meat from Choice grade animals as compared to those of lower grade.

Juiciness. The juiciness scores remained essentially the same in all experiments. Again, difference between grades did not show any appreciable influence on the panel scores.

Flavor of Fat. As it would be expected, there was no apparent difference in flavor of fat regardless of days aged or the environmental conditions under which the product was held.

Thawing and Cooking Losses. Observations by Wierbicki at the Ohio Station that aged meats release less moisture during thawing and cooking than non-aged or product that has been aged for a short duration, is substantiated

TABLE I

THE EFFECT OF ENVIRONMENTAL CONDITIONS ON SHRINKAGE, THAWING AND COOKING LOSSES AND PALATABILITY FACTORS

				ENVIRONMENTAL CONDITIONS			MOISTURE LOSSES (%)			PALATABILITY FACTORS				
Product	Grade	No.	Days Aged	Temp. (°F.)	Rel. Hum. (%)	Air Flow (LFM)	Cooler	Thawing	Cooking	Tender-ness	Flavor	Aroma	Juiciness	Flavor of Fat
Ribs[1]	Good	7	6	36	80	20-25	3.48	1.74	25.13	4.51	5.10	5.21	4.53	4.00
Ribs[1]	Good	16	12	34	90	15-20	4.06	0.91	24.84	4.63	4.74	4.71	4.45	3.89
Fore[1]	Ch.	4	14	40	80	15-20	3.15	0.93	25.18	4.70	4.82	5.28	4.70	4.90
Hind[2]	Ch.	4	14	40	80	15-20	3.05	2.35	30.06	4.12	4.91	4.55	4.71	4.00
Fore[1]	Good	4	14	40	80	15-20	5.25	1.31	25.04	5.15	4.85	4.75	4.71	4.85
Hind[2]	Good	4	14	40	80	15-20	2.85	1.64	32.47	5.05	4.95	5.21	5.05	3.83
Fore[1]	Good	8	3	36	90	25-30	2.20	0.82	31.09	4.15	4.70	4.58	4.22	3.40
Hind[2]	Good	8	3	36	90	25-30	2.08	3.56	33.83	4.02	4.43	4.45	4.15	2.92
Hind[3]	Ch.	7	3	36	90	15-20	0.95	0.45	25.09	4.30	5.11	4.85	5.05	4.70
Hind[2]	Ch.	7	3	36	90	15-20	0.95	2.53	22.41	5.08	5.30	5.05	5.70	4.40

[1]Rib steaks used for taste panel evaluation.
[2]Top round steaks were used for taste panel evaluation.
[3]T-bone steaks were used for taste panel evaluation.

by this report. As an example, we see that Good wholesale beef ribs aged 6 days lost substantially more moisture during thawing and cooking than did comparable ribs aged 12 days. A further examination of the data reveals that the top round steaks lost more moisture than the corresponding rib steaks due to thawing and cooking.

SUMMARY

Choice and Good hindquarters, forequarters and wholesale ribs from 46 cattle weighing 800-850 pounds were aged at 36°F. This product was aged under relative humidities varying from 80 to 90 per cent and air velocities of 15 to 20 lineal feet per minute.

On the basis of the results, the following findings appear most significant.

Grade, length of the aging period, and relative humidity of the aging room are the critical factors affecting shrinkage. Tenderness, flavor, aroma, juiciness, and flavor of fat values were determined.

The water holding capacity of the product increased with aging since the aged product (12-14 days) released less moisture during thawing and cooking than the product aged at shorter duration (3-6 days).

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DR. SCHULTZ: May I ask a quick question? Were these meats frozen?

MR. SLEETH: Yes, these were frozen. Just as soon as the aging period was over they were frozen so that we could get them all on the same basis, since we could have our taste panel's evaluations only at a given time.

DR. SCHULTZ: What do you mean by environmental conditions temperatures of 33 to 35?

MR. SLEETH: Those are the environmental conditions in the aging room, humidity, air flow and temperature.

MR. HENRICKSON: Thank you for pointing out some of the factors that need to be considered in low temperature aging.

We will go right on to the next topic, that of aging at high temperature. George Wilson. (Applause)

MR. GEORGE WILSON: Thank you, Bob.

Dr. Wang has described in some detail part of our studies on meat tenderization, that having to do with proteolytic enzymes, and I should like to describe another phase of our research on meat tenderness, the topic of this discussing being aging at high temperatures.

Dr. Deatherage has mentioned a number of things that could be and probably are related to meat tenderization during aging. I am sure that we subscribe to many of the points that he has brought out in his talk this morning. However, I think that we still will go along with the thesis that there is a time-temperature relationship taking place during aging, and this is supported in many places. Some of Dr. Deatherage's data this morning, the Tender Ray process of Kroger, is another example of it.

Until the advent of antibiotics and irradiation, a temperature of 60 or 65 degrees was the upper limit to which we could go in establishing this time-temperature relationship.

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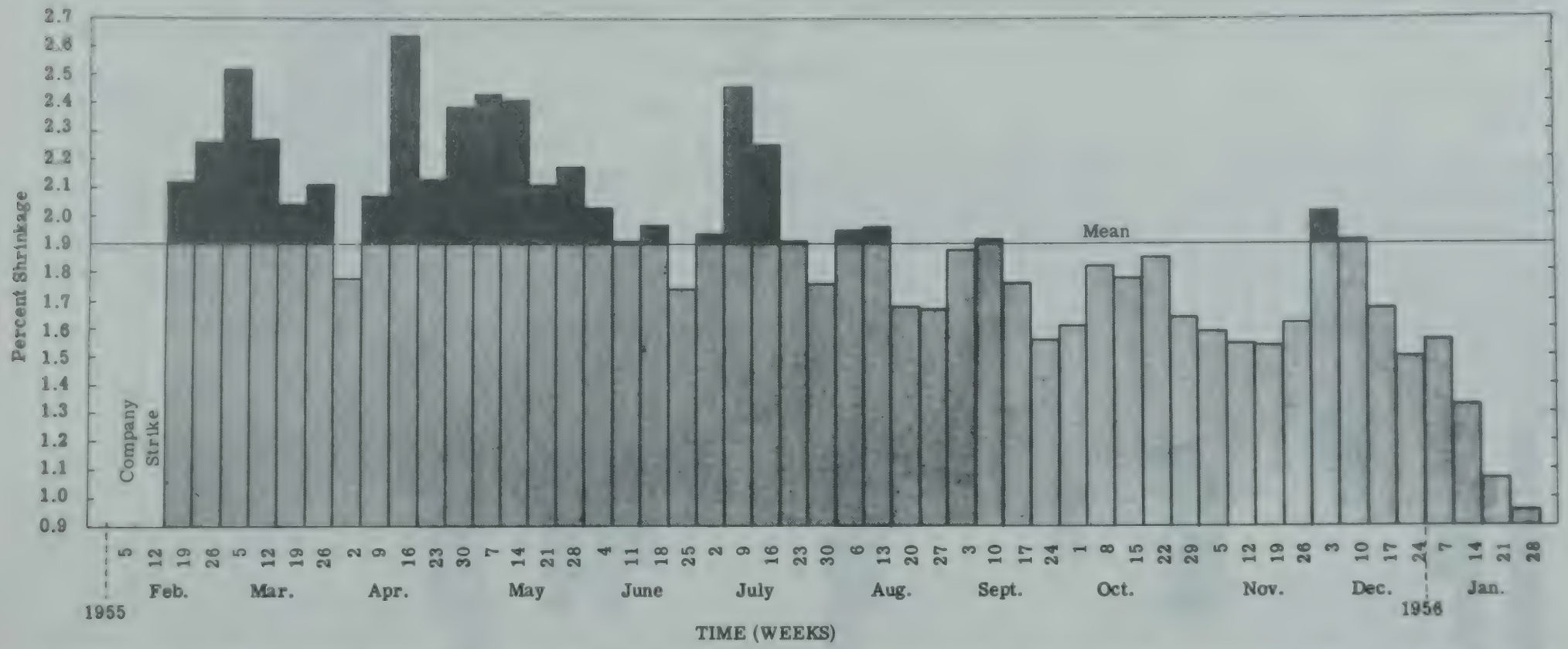

FIGURE 3 -- COOLER SHRINKAGE (MOISTURE EVAPORATION) FROM U. S. CHOICE GRADE BEEF HINDQUARTERS. Hindquarters aged 15-18 days, 33-35° F. and 88-92% R.H. Data collected for 52 weeks (Feb. 5, 1955-Jan. 28, 1956) and included 6,671,451 total pounds aged or an average of 125,877 lbs. per week.

Data from the warehouse of a major supermarket operator.

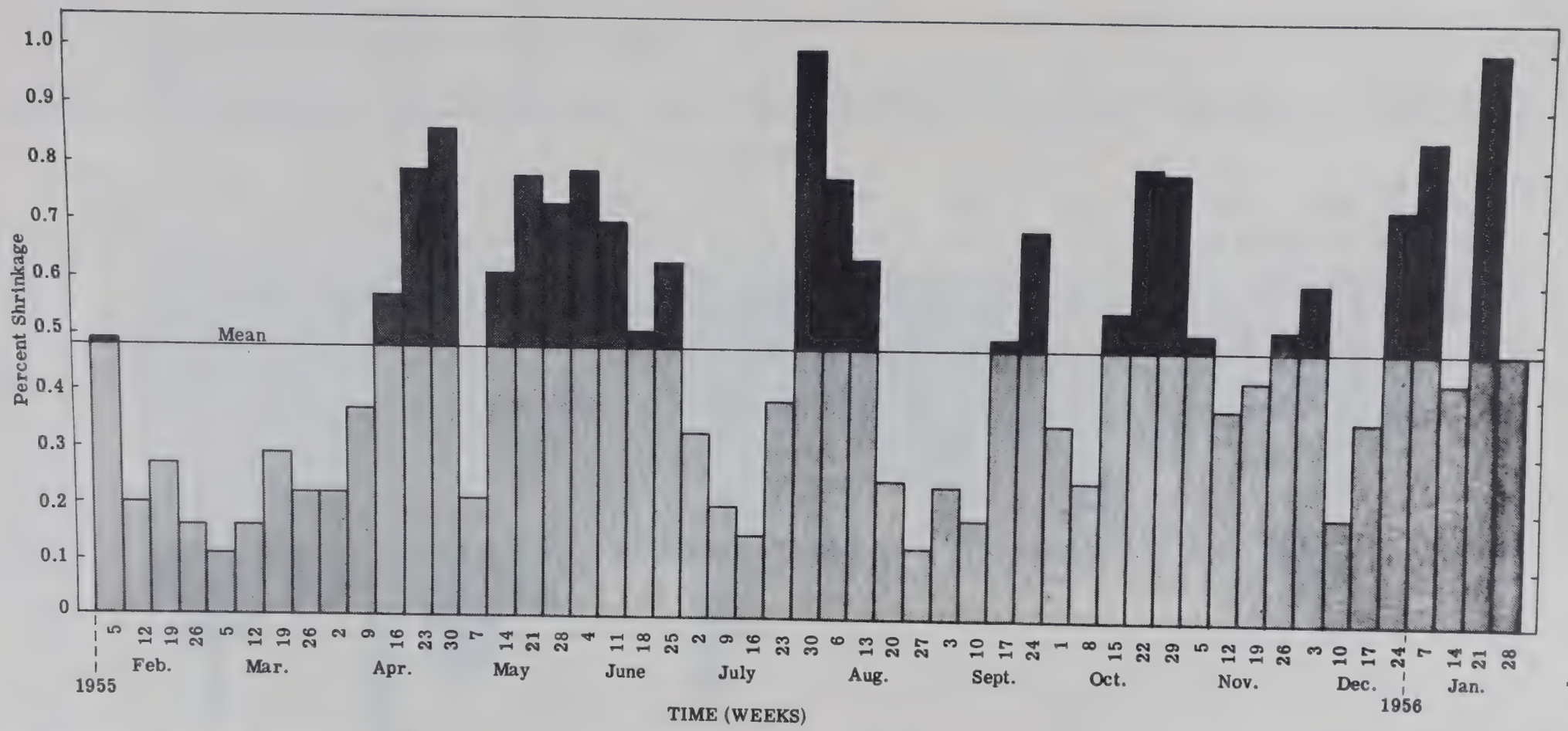

FIGURE 4 -- COOLER SHRINKAGE (MOISTURE EVAPORATION) FROM U. S. CHOICE GRADE BEEF FOREQUARTERS. Forequarters aged 5-7 days, 33-35° F. and 88-92% R. H. Data collected for 52 weeks (Feb. 5, 1955-Jan. 28, 1956) and included 8,296,222 total pounds aged or an average of 156,532 lbs. per week.

Data from the warehouse of a major supermarket operator.

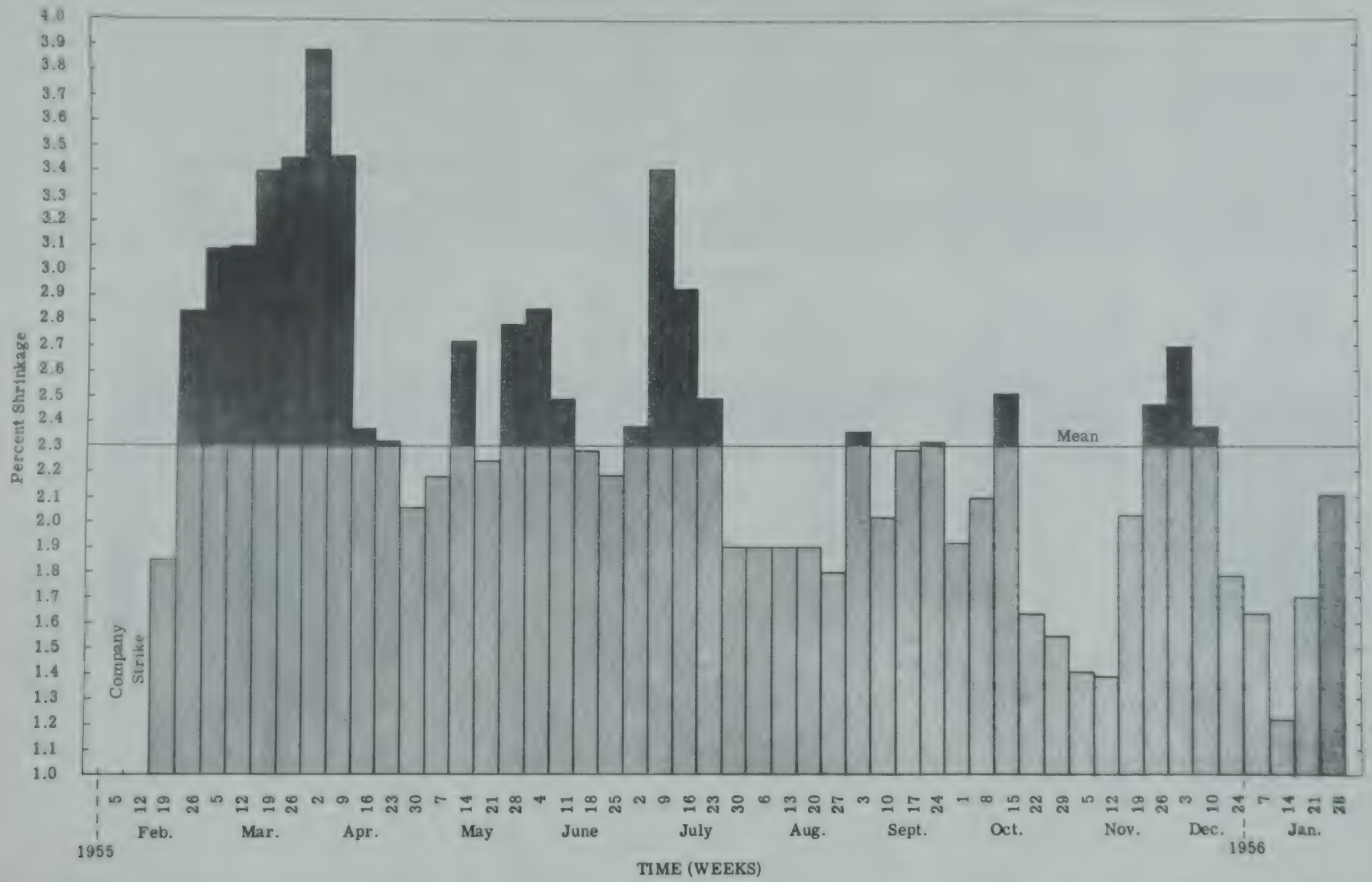

FIGURE 5 -- COOLER SHRINKAGE (MOISTURE EVAPORATION) FROM U. S. CHOICE GRADE BEEF RIBS. Ribs aged 15-18 days, 33-35° F. and 88-92% R.H. Data collected for 52 weeks (Feb. 5, 1955-Jan. 28, 1956) and included 1,019,655 total pounds aged or an average of 20,393 lbs. per week.

Data from the warehouse of a major supermarket operator.

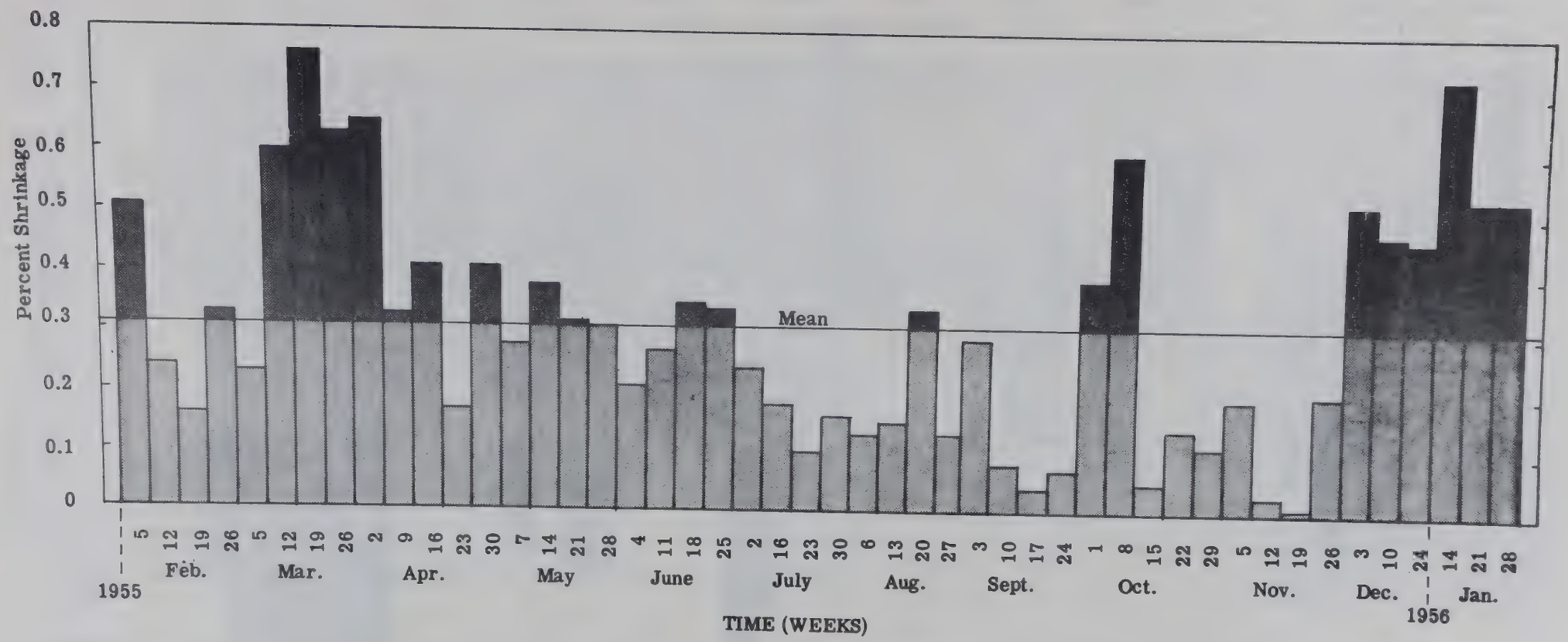

FIGURE 6 -- COOLER SHRINKAGE (MOISTURE EVAPORATION) FROM U. S. CHOICE GRADE BEEF LOINS. Loins aged 18-21 days, 33-35° F. and 88-92% R.H. Data collected for 50 weeks (Feb. 5, 1955-Jan. 28, 1956) and included 987,122 total pounds aged or an average of 20,565 lbs. per week.

Data from the warehouse of a major supermarket operator.

AGING AT HIGH TEMPERATURES

GEORGE D. WILSON

AMERICAN MEAT INSTITUTE FOUNDATION

One phase of the research program on meat tenderness at the American Meat Institute Foundation is directed toward determining the optimum environmental aging conditions for the rapid tenderization of beef. Because the increased tenderness achieved during aging is largely, if not entirely, dependent on the endogenous enzymes in the meat it may be assumed that the aging process can be accelerated by raising the temperature of holding. Until the advent of antibiotics and irradiation, there was no practical means of investigating aging at elevated temperatures.

In our work, we have chosen three temperatures of aging, 60° F., 90° F., and 110° F., and we wish to determine the optimum time for aging at each of these temperatures. Antibiotics have been employed as the principal bacteriostatic agent, but more recently we have used gamma irradiation both alone, and in combination with antibiotics.

In our initial trials at 60° F., chilled intact rounds were artery and stitch pumped with 20 to 100 p.p.m. of antibiotic and the surface dressed with the same antibiotic or a chemical agent such as sorbic acid. While this procedure was effective in controlling microbial growth at 60° F., the variability in tenderness between animals, sides, muscles, and within muscles precluded an accurate evaluation of the changes taking place during holding. At least this is true for studies that we were making.

This led to the use of steaks cut from the top round, which permitted randomization of the steaks with respect to animal, side, and muscle location. In using antibiotics, the top round was stich pumped prior to the removal of the steaks. Each steak was then packaged in Cry-O-Vac and allotted to a particular treatment. Vacuum packaging reduced the need for a surface dressing since most of the antibiotic resistant flora consisted of yeasts and molds that are obligate aerobes. U. S. Utility grade cow rounds have been used for the experimental work. These were received and pumped with antibiotic 48 to 72 hours post mortem.

Steaks held at 35° F. for five days were slightly more tender than they were prior to aging. This was also true of steaks held at 60°, but not until the seventh day of aging was the increase in tenderness in steaks held at 60° F. significantly greater than the increase in tenderness in steaks held at 35° F. These results were obtained on eight rounds, and the increases in tenderness was not marked, but the data indicate that for U. S. Utility grade rounds, the optimum aging time at 60° F. is at least greater than five days.

Results from experiments using 90° F. as the aging temperature have been limited since antibiotic alone in concentrations up to 100 p.p.m. was

insufficient to control microbial growth for more than one day. After one day of aging, the increase in tenderness at 90° F. was not significantly greater than the increase at 35° F. The combined effect of 20 p.p.m. of antibiotic and gamma irradiation has permitted the holding of steaks at 90° F. for four days. The initial trials using the facilities at the Argonne National Laboratory were used primarily to investigate microbiological control, and the effect of the procedures used on other qualities of the meat and the steaks were not evaluated for tenderness. A level of gamma irradiation much higher than the 200,000 rep used in these experiments would permit still longer aging times at this temperature, but as research elsewhere points out would exaggerate the slight off flavors noted at 200,000 rep. Because of this limitation, it appears that four days is about the maximum time steaks could be aged at 90° F.

Microbiological growth was more readily controlled at 110° F. than at 90° F. when antibiotics were employed as the only bacteriostatic agent. Tenderizing effects at this temperature have been variable. In an initial experiment, 24 hours aging at 110° F. had a pronounced effect on tenderness. In a later experiment, there was no apparent increase in tenderness after 40 hours. Studies are being continued to more accurately evaluate this aging temperature.

The experimental aging of beef at elevated temperatures requires a careful examination of the product prior to serving it to a taste panel. In these experiments, portions of the aged beef are removed and analyzed for total aerobic population, population capable of anaerobic growth, and the presence of toxigenic staphylococci. Samples are considered to be unacceptable for organoleptic testing when the anaerobic count is in excess of 300,000 per gram, or if microscopic examination of any colonies picked from the recovery medium shows gram positive rods. In addition, if there is any evidence of staphylococcal growth, using the tellurite glycine medium of Zebovitz, Evans and Niven as the criterion, the meat is discarded.

Possible toxin production during aging is tested by inoculating mice with a suitable dilution of a water extract of the aged steaks. (A report of work done under contract with the U. S. Department of Agriculture and authorized under the Research and Marketing Act of 1946. The contract is being supervised by the Eastern Utilization Research and Development Division of the Agricultural Research Service.)

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DR. HENRICKSON: Thank you, George. It is interesting to see how rapidly we are speeding up everything else. We might just as well speed up this business of aging and get it done in 24 hours.

We had another topic which we felt should be discussed this morning, but in arranging the program we found that it was difficult to get it in the two-hour period. However, we have asked Dr. Hiner to

lead the discussion period and, if he will, we should like to have him say a few words about the influence of breeding on tenderness. Maybe this is on the spur of the moment, R. L., but if you will we will appreciate it.

DR. R. L. HINER: Mr. Chairman and Members of the Reciprocal Meat Conference: I had intended to mention the fact that nobody in the group had brought up the point that there is a possibility that heredity may be a factor in this tenderness and it is being overlooked a little this morning. We have been doing a little investigation work along this line, and now at present we are trying to develop a satisfactory method by which we can tell how tender a live animal is. So far our results have not been too encouraging.

Of course, we are using a biopsy sample. We have used fiber diameter as one of our measures, and we are also using a mechanical shear, trying to develop something there that we can take a small sample from the round. We have been using the semitendinosus muscle. In a brief review of this, I was interested in the methods that Dr. Schultz reviewed. I might say that I had an interesting experience in the past month. There was a man from England, from the low temperature laboratory there, who spent a couple of hours with me one day. He was talking about a tenderness machine that has recently been developed in Germany. Apparently, it has a little different principle than what most of them have been working with here. It is an all-handmade job. They have obtained one of the instruments. I believe there are only three of four of them available. They cost something like $1,000, and they are supposed to be the last word. He didn't know too many of the particulars. He is going to get them and send them to me when he gets back home.

I think that we have probably covered all of the different procedures that we are using in trying to determine tenderness. We have been trying to see what we can get out of hydroxyproline. We have run into a lot of difficulties, and so far we are not too happy with the results. However, we are still going to continue to see if we cannot modify it and possibly obtain something.

We are very much interested in the fat problem with relation to tenderness. I have an entirely different feeling toward the problem than Dr. Deatherage has expressed. I feel that it requires a certain amount of fat. However, I think we have to think of fat in terms of the liposome body probably within the fat itself more than the fat on the outside of the animal, and I have an histologist who is now working on this angle of it.

I might say that some of these other methods, such as the use of enzymes in tenderizing, are all very interesting. However, I have never failed to sample one that didn't have an after-effect of flavor that I did not particularly desire. I don't know, but if they could get that out of it, it might be all right. This idea of aging at high temperatures, rapid aging, may be all right, too.

Now I believe I will throw it open to questions that anybody might want to ask, and we will see if we can get some controversy. Does

anybody have questions that he would like to ask of any of these five men?

MR. FLOYD CARROLL (University of California): I should like to ask, Dr. Wilson, about how much shrinkage do you get from aging at really high temperatures, say 110 as compared with 60?

DR. WILSON: We are aging these in Cry-O-Vac bags and they are aged as steaks. So what I say would not necessarily be applicable if you were aging a round. By this procedure we get a greater shrinkage during the aging period but much of that is made up in the cooking. In other words, they lose pretty close to a constant amount of juice whether they are aged at 35 or 110. It is a matter of where that juice is lost. One is lost during aging and the other is lost during cooking.

DR. HENRICKSON: I should like to ask George if in putting it in the Cry-O-Vac bags he draws a vacuum on them.

DR. WILSON: Yes, we do.

DR. HENRICKSON: If you do draw, say a high vacuum, do you anticipate that will reduce the amount of enzymatic activity, the oxygen starvation there?

DR. WILSON: No. The way we look on that is that you are making that steak much like it would be inside the round as you can. I mean I know of no evidence for this. I have heard, as I am sure a good many of you have, about oxygen starvation during aging. I don't subscribe to it myself until proven otherwise.

DR. HENRICKSON: The question I had was, if you took away all the oxygen, would the enzyme systems continue to break down the protein material?

DR. WILSON: If they will function in the center of the round they should function in the Cry-O-Vac bag.

DR. HINER: You get a sort of vacuum in the center of the round, a condition comparable to a vacuum?

DR. WILSON: Yes.

MR. E. J. BRISKEY (University of Wisconsin): I should like to ask, Dr. Deatherage, first of all in comparing two samples of widely differing tenderness, for your comments on the relationship of the total cation exchange in comparison with the shift and, second, if you found any differences in total strength concentration in the two samples of that nature.

DR. DEATHERAGE: Well, I would say that we don't have enough data to take the correlation of values between tenderness and, for example, the amount of sodium that happens to be in one fraction and another amount in another fraction. There was one slide, whether you

remember it or not, that gave the range of values of the total amount of ash - I mean the total amount of these ions. An animal can't live outside about plus or minus 10 per cent of its normal osmotic pressure, and actually the total amount of ion is pretty well regulated within 10 per cent of the mean. So I cannot answer your question any more than that.

DR. HINER: Any other questions?

There is one question about the excess of 4 per cent shrink in some of these animals that Mr. Sleeth reported. Isn't that a rather high shrinkage?

MR. SLEETH: I just used that as an example. Our normal shrink has been around what we reported on the other slides - about 2 per cent.

DR. HINER: You don't have any explanation for that? Is it a function of relative humidity?

MR. SLEETH: Yes, the shrinkage certainly is correlated with the amount of relative humidity you have in the cooler. The higher the relative humidity the lower the shrink. We have shown that in several tests.

DR. HINER: I believe I will turn the meeting over to the Chairman, if there are no other questions.

DR. HENRICKSON: We are already running past our time but I should like to say before I turn it back to Tom that it has been a real pleasure for me to work with this committee. They responded very quickly to our requests. Also it has certainly been a pleasure to work with the Executive Committee, Tom. Thank you.

CHAIRMAN BLUMER: Thank you, Bob, for a job well done, and the members of your committee. We certainly appreciate it.

In the interest of time we will dispense with any other repartee and you will return at 1:15. It is now 12:15. I think we cannot cut it any shorter than that because there are some committee meetings and I know that some of you have room arrangements to make. But please be back at 1:15.

(The meeting recessed at 12:15 o'clock.)

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MONDAY AFTERNOON SESSION

JUNE 10, 1957

The meeting convened at 1:15 o'clock. Chairman Blumer presiding.

CHAIRMAN BLUMER: I should like to recognize an old friend of many of us, Mr. George Tupper, with Russell Harrington Cutlery Company, in the back of the room. He has, as usual, a small gift for each of us. If you will stop by his booth some time this afternoon he will favor you with this token from his company.

We will dispense with the roll call until after the first committee presentation, in order that everyone may be here.

So for the Research Review Committee, my neighbor from the South, Dr. A. Z. Palmer, Chairman, will conduct the discussion.

DR. A. Z. PALMER: When our Executive Committee met this past fall we tried to decide who should accept the responsibility to discuss the abstracting activities, and it boiled down to the fact that I was too embarrassed to ask anybody else to do it; so I insisted with Tom that I should accept the responsibility. Therefore, I should like to introduce a fellow by the name of Palmer who is going to discuss the status of the abstracting activities.

I have two problems in presenting them. I have too little to say and I have been allotted too long a period of time to say it in. Furthermore, Ken Franklin printed the title wrong. I don't know whether you caught this or not, Ken. It should be "The Status of Abstracting Inactivities." (Laughter)

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STATUS OF ABSTRACTING ACTIVITIES

A. Z. PALMER

UNIVERSITY OF FLORIDA

I want to introduce the central theme, and I should like to make this fairly clear; so I am going to read it. I have it in quotation marks, I have it circled in red ink, and I have it underlined. "We all need to do more work." I should like to build my entire talk, which I shall make as short as I can, around that central theme.

The abstracting idea germinated in 1951. It took root in 1952. It bore fruit in 1955, under the able leadership of a good committee, a strong committee, under the leadership of Jerry Wanderstock. In June, 1955, or through the end of that year we had 50 abstracts turned in by four workers; in 1956, 35 abstracts by nine workers; in 1957 thus far, 100 abstracts by two workers, or a total of 185 abstracts by 10 workers.

A number of you have indicated that the periodicals that you were abstracting were unproductive. I might add that about 100 of the 185 have been turned in by our good friends from Michigan State University, Lyman Bratzler and Al Pearson. I tabulated to see who was the winner. It has been nip and tuck all the time between them. I think they are fighting to see who can turn in the most, and that is good. Lyman sent in the last bunch. He sent it in secret so that Al would not know anything about it and he got one jump ahead of him on this 1957 bunch.

We have a backlog of abstracts sent in before June, 1955. The number I have not completely determined. I have some myself. Some of the Abstracting Committee still have some of them. We have been covering 75 publications with approximately 50 abstracters. Last year Dr. Wanderstock made a very good plea to you to get in there and pitch and turn in some abstracts this year. Last year at that time the assignments were brought up to date. We requested a status report from each of our active abstractors and we got 16 responses. Jerry made me feel better by saying that that was about par at that time.

We have not hounded you this past year because I feel that to some extent this is a type of thing that naturally slides and can be picked up fairly quickly in case you want to get in there, because if Lyman Bratzler can abstract 50 in January and send them in, the three or four that the others have can be done and they can catch up easily enough.

The objectives that we set up last year were first to bring the abstracting up to date. We haven't done it but we are doing fairly well with it.

I have had requests from a number to reassign magazines to them. This we have done in part, but some of you still have not received your

reassignments. Some of you want to abstract and you don't have journals assigned to you. This is because we wanted to have a good idea as to which journals are fruitful. We have a good number of publications on our list that have not been productive in about nine years. This I know from reports sent in. Bob Bray had two, Bob Henrickson, George Wilson, Dr. Hall, Vern Cahill, to name a few who have indicated that some of their publications are not fruitful. Others have talked to me personally. So I know that we can tabulate them now and weed out some of them and concentrate on some of the others, the more fruitful publications. That is my idea.

So our objective for next year is the same: To get our abstracting up to date. This is not going to take a lot of time and trouble.

Thos who still need assignments, if they will, check with me or the committee.

With the abstracts that we have accumulated, our Research Review Committee can go to work now with a backlog that will keep us busy, and we can do some good and be fruitful in the next year or so.

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CHAIRMAN BLUMER: Thank you very much, Zane.

Last winter, when we were in here for the Executive Committee meeting, Ken Franklin, of course, was with us, but, you know, on that day he acted about the same as he does just before the contest at the Chicago International. Most of you know how that is, flitting about from one side of the arena to the other, and the reason for that was, it says on this little card here: Born to Alice and Kenneth Franklin, James Kenneth, March 14, 1957, six pounds thirteen ounces.

I think he deserves a hand for that. (Applause)

I will now turn the program over to Ken for the roll call.

SECRETARY-TREASURER FRANKLIN: Well, this group certainly has grown. Two or three years ago I thought I knew everybody who came here. I find today that I don't. I am just as anxious as the rest of the old-timers to get acquainted with the new folks who are here. We will do it the same as we did last year. Going down the line we are going to ask you to stand up and introduce yourselves, giving your names and your associations.

But to start the ball rolling I am going to introduce the first man, a man who really needs no introduction to any of you who have been here before, the man who probably is most responsible for the inception of this conference, the former General Manager of the National Live Stock and Meat Board, one of the best bosses you could ever have to work for, Mr. R. C. Pollock. (Applause)

We are certainly happy that you can be here with us, Mr. Pollock. We hope that you will be able to sit through the rest of the sessions, and we certainly want you to join with us for dinner tomorrow night.

Tom, will you now continue to roll the ball?

(Each person in turn arose and introduced himself.)

SECRETARY-TREASURER FRANKLIN: Thank you, folks.

I don't know if anybody tried to make a count, but if our figures are correct, there are more than 115 attending this conference. It is by far the largest conference we have ever had. There are some 35 colleges represented here.

Also just to make sure that our records are correct, if any of you have not registered with our secretary, Mrs. Drinane, please do so, so we may have your name on our list.

Tom, I will turn the program back to you.

CHAIRMAN BLUMER: At this time I think that we should recognize a few changes that have taken place since last year's conference.

First Ralph Soule, former of Kansas State, is now with Charles Pfizer and Company.

Dr. B. S. Schweigert, known to us as Bernie -- I don't know whether we may still call him that or not, but I am going to until he stops me -- is now Director of Research and Education at AMIF. Along with him they moved up Dr. Charley Niven to Associate Director and also Dr. D. M. Doty to Associate Director.

Jim Stouffer is now at Cornell.

And Mel Hazaleus -- Mel, where are you now?

MR. HAZALEUS: At Colorado State University.

CHAIRMAN BLUMER: You have been there for fifteen years.

MR. HAZALEUS: But since May 1 it has been a state university.

CHAIRMAN BLUMER: Since our last conference meeting, Dr. O. D. Butler, a man of whom Texas can well be proud has been made head of the Department of Animal Husbandry.

Bob Merkel, formerly of Wisconsin, is now at Kansas State College.

Ken Warner announced his own change, formerly of the USDA and now, as he says, a professor at the University of Maryland.

Are there others? Well, I hear of no others; so we will get on with our regularly scheduled program, the Research Methods Committee. The Chairman is Dr. B. S. Schweigert. Bernie. (Applause)

DR. B. S. SCHWEIGERT: Thank you, Tom.

I wonder if the speakers on this program would either come up or be very readily available to come up so that we can conserve time.

We have allowed sufficient time for lots of discussion, but I see that we are a little late starting; so I will move right into the objective of this session, which is to acquaint you with some of the newer technics in meat research specifically related to proteins. If you are not actively engaged in it, you may have an occasion to be a consultant on such a project at your own institution, or you may have an occasion to get in touch with some of the leaders in protein research. If any of these are accomplished this afternoon we will consider it a success.

Now, as you will note from the program we are utilizing Fred Deatherage on this program, and his many attributes include being in the forefront in research and also as an hypothesizer, as you noted this morning. I am dead sure that he will stick to character again this afternoon, with the possible one exception that his talk will be for twenty minutes. (Applause)

Fred, it is with real pleasure that I introduce you to highlight this afternoon's program on some of the new technics in protein research.

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METHODS FOR STUDYING THE WATER-HOLDING CAPACITY OF PROTEINS IN MEAT

F. E. DEATHERAGE

OHIO STATE UNIVERSITY

Rather than speak specifically on new techniques on protein as in the printed program, I would like to spend a few minutes indicating to you some of the methods we have found satisfactory in our meat program. At the outset I should like to say that as you observed the data and the curves which I showed this morning very little was said on the methods for obtaining these data. It is only fair to say that in order to get good methods which are reproducible is not always easy, and this is doubly so for some of our meat work. For example, Dr. Wierbicki spent almost two years working on our method for determining hydroxyproline. Almost a year was spent in developing a satisfactory technique for measuring actomyosin in meat. We should also make the point that sometimes the methods we use are not entirely original with us, but may be modifications of methods found by workers in other fields. Methods have been developed by muscle biochemists and physiologists who are interested in understanding the action of muscle in situ. Methods by such workers are not directly adaptable to meat. Again referring to the hydroxyproline method, the original was suggested by Logan, yet we found it very difficult to apply in meat.

In the newer methods which have been developed for the studying of proteins, such as electrophoresis, ultra centrifugation, index of refraction, and dielectric constant method, all require work in relatively dilute solutions and are not particularly applicable to meat. All of these have been used in one way or another for the study of protein hydration, but I think we must admit that hydration in very dilute solutions is quite difficult for hydration in meat, which runs better than 20% protein. We are, therefore, faced with the problem of developing methods which in one way may be considered empirical, but which may give useful information nevertheless.

I would like to show you two slides of the type of information which we have been able to obtain and which have made possible the interpretations we gave this morning. In the case of the second slide I would like to call your attention to the radical changes in tenderness and water-holding capacity which have been brought on by modification of the ionic atmosphere in muscle. First I would like to say that one method which we have found most satisfactory which we have indicated in this slide is the modification of meat by means of the infusion of the vascular system. I do not know what we would do without Dr. Cahill who has been so helpful in this part of our program. We have been using infusion techniques for almost eight years. More recently we have been studying the effect of certain ions by using matched rounds of beef. The infusion technique is very simple when one talks about it, yet I hasten to add that it does take a bit of practice in order to apply efficiently. For whole animals we modify by bleeding by the jugular vein and carotid arteries

and infused by way of the carotid artery. For excised parts we infuse simply by pumping the available arteries. Whereas in the intact animal fairly even distribution may be obtained by using pressures equivalent to normal blood pressure, in the excised portions above blood pressure may be necessary, perhaps fifteen pounds or more.

In studying the water-holding capacity of meat and its relation to tenderness and shrinkage we gave considerable thought to developing satisfactory methods which would give us sufficient data in a reproducible manner to permit the drawing of valid conclusions. Our first evidence to the relationship of shrinkage to tenderness was obtained using fairly large samples of meat in centrifuge bottles. This could be done, but it was cumbersome and time consuming. We developed these tubes which I show here which permit 25 gram meat samples to be used. You will note that in the upper portion of the tube we put the sample resting on a loose fritted glass disc. The smaller part of the tube is graduated so that direct visual measurement of the liquid may be made. It was necessary to establish the proper centrifugal rate, manner of heating to assure reproducible results. In this instance this did not prove to be a great stumbling block. A weighed portion of either ground or unground meat is placed in the top portion of the tube, stoppered with Bunsen valve or capillary and heated in a water bath at the temperature under study. Heating is continued for thirty minutes. The tube is cooled to about 30-35° C. and then centrifuged at 170 times gravity for ten minutes. While using a magnifying glass and estimating any fat in the liquid, juice expressed can be determined with an error of + or - one-tenth millimeter. We have found that for studying the drip of fresh meat or frozen and defrosted meat the sample should be equilibrated to 40° C. This is to prevent solid fat from interfering with the determination. The tubes that I am showing you here were made for us by the Corning Glass Works. We pay approximately Ten Dollars each. From the number of requests that we have had, it appears that other laboratories are using them and I would hope that the price would drop, but I have no information on that.

A simplified method for determining water-holding capacity of meat proteins has been developed in the German Institute of Meat Research at Kulmbach. The method was developed by Drs. Hamm and Grau and has been studied also in England. The method uses filter paper. Approximately four to six hundred milligrams of meat sample is placed on the filter paper which is then placed between two lucite plates. Five hundred pounds per square inch pressure is applied for one minute. The amount of water released is approximately sixty milligrams per each square inch of wetted surface. These authors have applied this technique to frozen beef, fresh beef and some pork products. We have compared this with the tube method in our laboratory and find excellent agreement on fresh meat. However, the tube method and the German method do not agree on cooked meat. I have two samples here which indicate how the method works. By using a pencil one outlines the periphery of the moisture ring and also of the protein ring. These then are measured by a planimeter. This difference between the two rings is a measure of water or juice expressed. It is very interesting that the area of the paper under the protein film does not contribute to the juice figure. Why this is so we do not know. I would like to share with you and I have drawn on the board a sketch of our results using the method of Hamm and Grau. This work was begun before Dr. Wierbicki left our laboratory and I am grateful to him and the

Rath Packing Company for letting him complete this work and share these results with you. I would like to have you observe the linear relationship between the area of free moisture and the grams of free moisture. This filter paper method has the advantage that it can be applied to a very large number of samples and requires less time than the tube method. Consequently it may be of great value in studying raw and frozen meat. Since, however, it does not correlate well with the tube method for cooked meat we feel that we are obliged to use only the tube method. The tube method has the further advantage that two usable fractions are obtained for future study. In our work, as you have seen, we have done considerable study of the various ions in the juice fraction and also of the meat or protein coagulum fraction. We feel that these tubes show great promise in studying the chemistry of meat during cooking.

You have noticed this morning and again this afternoon that we have made many references to the sodium, potassium, calcium and magnesium contents of meat or fractions thereof. The properties of proteins and particularly their water-holding capacity is a function of pH and the ions on the protein or in the protein solution. In order to study the effect of certain ions it became necessary to develop a technique for measuring them with some degree of rapidity. Twenty years ago one would be considered almost fool-hardy to embark on a study of these ions because of the difficulty of their determination. However, with the advent of chromatography this has not proved difficult. In studying the ion balance in milk, Professor E. F. Almy and one of his students, Dr. William Sutton, modified several techniques of other workers into a simplified scheme. The basis of their method is the chromatographing of the chlorides on ion-exchange resins and eluting with varying strengths of hydrochloric acid. By calibrating the column it became possible to take aliquots of certain fractions, evaporate to dryness, and titrate the residual chloride. From this the cations could be computed. We have adpated this to meat and its fractions. We find this more satisfactory then flame photometry because the ratios of sodium and potassium are more optimal for this technique.

Before concluding, I should like to say that in no way do I want to discount some of the more elegant techniques for studying protein. Indeed they have very great potential in studying meat.

I put in your hands of those of you who are interested reprints of our work which gives the details of the development of these procedures I have discussed. If any of you are interested in any of the other methods we are using in our laboratory we will be most happy to share them with you.

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DR. SCHWEIGERT: We certainly appreciate your sharing with us some of these newer approaches and newer technics applicable to protein and its interrelationship with other vital constituents of meat.

We are indebted to our good friend, Dr. Hall, at Kansas State, for suggesting the next speaker to the Research Methods Committee, and in circulating the committee for their comments they were very much interested in what Dr. Clegg would have to share with us today. He will describe some of their recent protein research. I am sure that some of the approaches that he has will be of interest to us.

It is my real pleasure to present Dr. Clegg at this time who will review for a similar period their research. (Applause)

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PROTEIN RESEARCH STUDIES

DR. R. CLEGG

KANSAS STATE COLLEGE

When I first went to Kansas State College I was very much interested. I am a poultry chemist there. That is my title on the books. I am not quite sure what that means, but I do most of my work with poultry. I was interested when I first went to Kansas State College in poultry meat, but after observing what they do with poultry in that section of the country, I decided that flavor, which is the thing that I wanted to study, was not very important down there. They barbecue all their chickens and they don't really taste any chicken at all.

In addition to that, the Home Economics Department was running a series of studies on tasting. Of course, if any of you have ever been on a tasting panel you realize that there is no flavor there but some stewed chicken and it really does not have too much flavor. We devised a group of diets in an attempt to vary that flavor. We also devised a diet which practically took the flavor out of the chicken. It was more or less of a purified diet, I will call it. Then we tried to put the flavor back into the meat again by adding various additives to it, grains, etc.. We dropped that because we found out that the easiest way to add flavor to the meat of chicken was to add about two shovel fulls of chicken droppings to each bag of feed and you ended up with a fairly good tasting chicken.

However, we have been working on technics to study protein, and we have been concentrating on electrophoretic technics. We were particularly intersted in phosphorus, in trying to find ways and means of determining where in protein mixtures you would find these proteins. We are, of course, talking of soluble proteins. You cannot do it with insoluble proteins with the electrophoretic technic.

We had two things we could do. We could fractionate proteins. If you have ever looked into the literature and you have seen the various long-winded methods they have for fractionating proteins, you realize that this is a sort of discouraging proposition, and I did not want to spend the next 20 or 25 years doing so. So, taking the easiest way out, you might call it the lazy man's way, we sat down and did a little thinking about it, and we worked out a combination of electrophoretic technics with radio-chemical technics that I think some of you may be interested in.

I talked about this with Dr. Hall before we came here, and he suggested that, since this would be quite a heterogeneous group, I take a few minutes in the beginning and explain what I mean by this electrophoretic technic and how we apply radio-isotopes to it, before I show you a piece of the equipment and some of the typical results that we have.

(Slide) Don't let this diagram scare you. This is just a diagrammatic sketch that I should like to use to indicate to you something that is sort of second nature to me, but I find that it is not second nature to most other people. What I have is just an U-tube here, and in this U-tube I have a solution. The cross-hatch part is a mixture of two materials which we call proteins A and B. The material above that is just a buffer solution, and there is actually nothing in between here. This is just where the two solutions come together to form what we call an interphase.

When a light shines through this solution this shows up in a photograph. I will show you what that looks like later on. Suppose you take this solution and you attach an electrode so that you have a minus charge or voltage on one side and, say, a positive voltage on the other side and you apply a potential across it. If these materials or proteins have a charge on them, they go to the positive electrode if they are negative and to the negative electrode if they are positive. They move away from each other. The front end and the back end of this slug of protein material will move just as fast as each other. In other words, as A moves up from this position to this position, it will move down on the other side. B moves only a short distance, for instance and it will move that short distance down on the other side. This is what they call an ascending and descending boundary in electrophoresis.

(Slide) Now I will straighten the tube out, so I can show you what happens as far as the concentration is concerned. You see there is protein here and there is protein here and all this represents is zero protein, and then when I get to this interphase I go from zero protein to whatever concentration I have in there. This is measured by an index of refraction. It does not show up on the photographic plate. It shows up like this. This little peak here.

(Slide) This is what happens when we have two in there that move at different speeds. You see this first one is the most concentrated and you get this first peak. Then the other one which is the least concentrated of the two kinds, the two peaks. It shows up as two peaks like this on the photographic plate.

(Slide) Suppose I not only have protein materials in there but I have them marked. Suppose I have been feeding an animal, let's say, radioactive phosphorus. These proteins are now active. At least some of them will be active and some of them may not be active. Here I have my electrophoresis set up and the materials are moving in this direction. Here I have the concentrations moving down the line, as I did before, except that I have one more. Here is the way it will show up on a photograph. Now if only the last two are radioactive and the first one is not, if I drill a hole in this cell and I put a counter right at this point I can count them as they go by. In other words, it is just as if you had 50 men running and ten of them could run 10 miles an hour, 10 of them could run 20, and 10 of them could run 15. They would arrange themselves into groups eventually. It so happens that the first group that went by was not radioactive, but the next two were and it would show up as the total number of counts on a Geiger counter.

(Slide) This is a picture of an end view of an electrophoresis cell, and this gives you an idea as to what these peaks look like in a

photograph. They start right down here, and this is the tube that I mentioned. This is the hole in the side of the cell. This is pyrex glass. It is less than .1 of a millimeter thick right there. As these various peaks move by that we can spot in the cell, you can put a Geiger counter alongside and count them. Then you can tell which of these peaks have the phosphorus and which do not have the phosphorus or the sulfur, whatever you want to measure, depending on whether they are radioactive or not.

I will show you the setup of the cell itself I think in the next slide.

(Slide) This is a glass cell. It is rather difficult on the photograph, but you see there the ground section of the cell. Here is the center portion right here where the solution moves by the hole, and this is the gadget on the side, the plexiglass frame that holds the Geiger counter.

(Slide) These slides are not very well adapted to this room. Can you see this back there? I am having difficulty, being close to it. This is the long tube that contains the Geiger counter and that fits right in next to the cell. This is the U-tube that I mentioned previously. This goes over to these electrodes on the side.

(Slide) This is good to measure phosphorus but it would not be much good for sulfur and materials that have a low count. So what we did in this case was grind a hole in the side of the cell. In this case you find a friend who is a dentist and you go in and use his dental tools and you grind a hole right into the side of the cell and cover it with just a little piece of polished styrene. This is a frame which holds an end window counter, as they call it, in this thing right up close to the side of the hole.

(Slide) You see this is the same U-tube except now instead of having the Geiger counter tube flat against it, we have an end window counter.

(Slide) This is the way this one looks in the apparatus. The glassware in this particular picture is out because it is clean. I want you to notice that. The only way you can photograph glass is to have it dirty, I found out. This was taken when it was very clean. So there it is again with the window counter fitted to the apparatus.

(Slide) As I mentioned, this is an electrophoretic picture. Those are the various peaks, for instance, of a solution of various protein components moving past this particular hole in the tube. Anyway, as the peaks move by this hole you take the number of counts at each point, for instance, A, B, C, D, etc.

You will notice that this picture has A, B, C, D, etc. along the top. Every place that is marked we measure. For instance, A gives us what we call the background count which for all practical purposes is zero or if it isn't zero we subtract it. B gives us the amount of radioactivity in this first fraction. C gives us the amount of radioactivity in the first fraction and the second fraction. You see, by going through this procedure and subtracting one fraction from the total number of fractions you can find the percentage of phosphorus in this particular mixture.

You can also get the amount of protein materials supposedly present by measuring the area under these various fractions. I think I have a picture coming up where we did that and I will show you how it works out.

(Slide) No, this is another one. I think this is egg white, although I am not certain. You can see that the background in this particular case was 30. As you go down, this is 31. There is not much phosphorus here. 38 here. There is not much phosphorus here. So we have four fractions in here which do not contain phosphorus. We begin to move over this back fraction here after the analysis has progressed, and then we see that our phosphorus has peaked, so we can pinpoint where the phosphorus is in this material.

(Slide) Here is an analysis. This just happens to be blood serum in this particular instance. This is fraction 1, 2, 3, 4, 5 and 6. This is actually the amount of phosphorus we can determine is in each of those fractions.

(Slide) You see that it is very possible by determining the phosphorus and running a nitrogen determination to get the nitrogen-phosphorus ratio in these proteins. This, for instance, is the amount of nitrogen in each of those components 1, 2, 3, 4, 5 and 6. You will notice down here it bears no relationship to the amount of phosphorus you have present there. So in this manner, you see, we were attempting to determine which of these fractions, whether it was the large or the small, contains the largest amount of phosphorus.

(Slide) This is just another one. It gives you another example with another picture.

(Slide) This is the part that interested me. Dr. Deatherage was talking this morning about his calcium, magnesium, etc. It was possible for us to shift this phosphorus, these various components, one way or another to determine which of these components, for instance, calcium would react with by determining the amount of phosphorus in these various fractions with and without calcium in this particular buffer mixture of proteins, and it struck me that this might be one way that his group could approach this problem of which one of these fractions in the meat, the calcium and magnesium were attached to.

These black bars will give you the amount of phosphorus in each of these fractions, A, B, C, D, etc., when calcium is not in the solution. These small ones give us the amount of phosphorus in those particular fractions up there when calcium was added to the solution. You will notice that it stays low until you go right to there, and actually you move a fraction this way and by so doing you can determine which one of those components the calcium is attached to.

I just happened to think, when I heard him talk this morning, that by using the juices from the cooked meat and the raw meat or the cured meat, etc., you might be able to find some ratio here as to which of these fractions the calcium was attached to.

This is a rather expensive way of doing business really. We decided that we would have to have an easier way if we were going to get anywhere

So we went into starch gels. Probably most of you have seen starch electrophoresis. By that I mean the granular starch. Starch that has just been mixed with water and allowed to settle and it comes out as a sort of paste. This is not that. This is a gel, a hydrolized starch. You can wash it. You can cook it. You run it into a trough and it turns out just like a good quality gelatin. It is nice and clear and bubble-free.

(Slide) You have a trough like this up here. This looks down on this trough. You fill this trough with clear gelatin solution and you cut a little chunk out with a knife and it lifts out just as easy as can be, just as if you were slicing gelatin. You pour your sample into that. Then you run this in the same manner that you ran the more complicated type of electrophoresis. When you have finished you dump it out and slice it into pieces, and you can analyze it for radioactivity, you can analyze it for nitrogen -- for almost anything you want. You can even recover your sample if you so desire by taking these samples and freezing them and pouring them or chopping them up into small pieces and mixing them with a little buffer and then letting them soak for a while. It works pretty well. I have some of them here.

I thought it would be better if I just showed you the results rather than trying to make a slice from it. A couple of them have radioactivity in them, so don't open them. I should like to have them back, if I may, because I was able to get them away from my graduate students only by telling them I would bring them back.

If you will tip them up you will notice that I have an electrophoresis here that has been run on these starch gels.

Then I have developed it with a Medo black which is a protein dye. You can get any number of fractions in this material. It is a very convenient way of doing it. You can set yourself up in business with this particular type of electrophoresis for a couple of hundred dollars whereas the other type costs many thousands, but this is very easy to do.

I will be down at the other end and collect them. I don't want them to get lost.

Well, I hope I have been able to show you a little about a technic that many people seem to be afraid of. The minute you mention it they all just run away from you and they refuse to listen and try to understand what you are trying to explain. I am a little lucky here this afternoon. I have a captive audience and I don't have to worry about its running too far.

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DR. SCHWEIGERT: We have, in opening the discussion, two short reports from two other groups, who will describe briefly some of their thinking with respect to research approaches with meat proteins. Leading this off will be our good friend, Joe Kastelic, who will share with us some of his thinking in this regard in a very short report. Joe.

DR. J. KASTELIC: Ladies and Gentlemen: Frankly, I don't know just why I am here. I haven't much to say and what I have to say represents very little the kind of experience that some people have described here in telling about the work they have done on meats.

From this discussion I have deliberately left out many aspects of research approaches with meat proteins, since from the program I assumed that some of the things that one could talk about would be discussed by other speakers.

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RESEARCH APPROACHES WITH MEAT PROTEINS

JOE KASTELIC

UNIVERSITY OF ILLINOIS

A subject as broad as this one cannot be meaningfully developed without considering what we mean by "approach," and we cannot dismiss this question in any specific discussion on proteins, for there are literally scores of approaches to the problem of developing an understanding about them. We say little of value if we merely say that we must know a great deal more about the physiological and biochemical properties and unique structural characteristics of the skeletal muscle proteins. The need for this kind of information is all too obvious. But I believe there is a need to look at skeletal muscle tissue somewhat differently than we are accustomed to regard it.

Too often skeletal muscle tissue is regarded as representing some relatively simple organization more or less homogeneous in make-up and possessing physical and chemical properties which can be described in a rather straightforward manner. There are many reasons why this sort of thinking has been encouraged. There are few observable differences in muscle tissue taken from animals of the same age and species. From the nutritionist's point of view, skeletal muscle proteins in aggregate serve as sources of dietary protein equally well regardless of source. What differences have been found in nutritional investigations appear not to be associated with amino acid content. Indeed it seems apparent that the amounts and kinds of amino acids in the various animal skeletal muscle proteins are remarkably similar. Differences in the digestibility of these proteins (stroma proteins excepted) are small, and it is agreed that the muscle meats of different kinds of animals are equally effective in maintaining nitrogen balance in experimental animals. The well-known and tremendously fascinating ability of muscle to do work by alternating contraction and relaxation is likewise a constant and dominant characteristic of muscle tissue wherever found in animal organisms.

Yet to consider muscle tissue anything less than anatomically, structurally, histologically and biochemically complex is most misleading. What then is skeletal muscle tissue? For one point of view cf. Huxley (1956). We cannot, or at least I cannot, answer this question directly. My own interest in meat proteins has been a narrow one, for I should like to know what happens to them post-mortem, during storage, processing and cooking. I would like to know what changes occur in them during aging of the animal and whether diet per se has any marked influence on muscle tissue protein composition. Why? Because if we knew something about these things we would be in a better position to produce meat and meat products which, for the want of a better way of saying it, are better to eat, look more attractive and smell good. Such a view, while of practical significance, is almost absurd, for we know so little about these things.

There is an enormous and significant literature available about the biochemistry of muscle, particularly in regard to the metabolism of nutrients

supplied to it via the blood circulation. In recent years there has been a tremendous interest in the mechanics and processes concerned with contraction and relaxation (Weber and Portzehl, 1952; Needham, 1952; Mommaerts, 1950; and Szent-Györgyi, 1951). Much is now known about the sequence of chemical events which occur in association with the enzymatic processes thought to be responsible for the contraction and relaxation phenomena. In these studies the role of ATP has been of particular interest.

Less is known about the changes which occur spontaneously in skeletal muscle tissue post-mortem and particularly during the development and resolution of the rigor state of muscles following the death of an animal. Bate-Smith (1948) has attempted to summarize the facts relating to post-mortem changes in meats, but was not able to present a conclusive theory about the actual cause of the increase in tenderness of beef during the "aging" process. It has been assumed that autolysis of the muscle tissues is largely responsible for many of the post-mortem changes in tenderness, but not every one has been eager to accept this view: Wierbicki et al., 1954, and subsequent reports (Miller and Kastelic, 1956). The principal biochemical events in the development of rigor appear to be associated with glycolysis, decreases in the concentrations of phosphocreatine and adenosine triphosphate and changes in ionic associations. The magnitude of these changes and the rates with which these changes proceed are apparently quite dependent upon temperature and the pH region traversed. We are almost totally ignorant about the degradation of the skeletal muscle proteins during rigor and subsequently, since the proteolytic enzymes of muscle tissue have been most refractory to work with. Some progress is being made, however (Snoke and Neurath, 1950; Wang and Maynard, 1955).

Experience tells us that the flesh of young animals is more juicy and tender than that of older animals; yet we do not know what explains this difference except to assume that the connective tissues are "tougher." Is this the result of significant changes in the chemical structure of these tissues? We are not able to say much about this, since turnover rate studies of collagen indicate these tissues to be remarkably inert (Thompson and Ballou, 1956).

This is why we ought to be vitally interested in the architecture or structure of connective tissue, the muscle proteins per se, if at all possible. When we say anything about the structure of protein macromolecules we may imply that the ultimate units or elements which make up the protein macromolecule can be distinguished and defined. In fact, what information is obtained, is obtained indirectly; for example, from sedimentation, electron microscopic, electrophoresis, x-ray diffraction, active group analysis and birefringence studies. From these and other studies, workers gain impressions about chain lengths, folding, spiralling and other form characteristics of the protein macromolecule. However, experience seems to indicate that individual components of muscle protein may exhibit different properties depending upon the procedure and conditions used to isolate them. Such problems present a variety of difficulties, for it is not always certain that a given preparation represents some discrete entity or whether it represents a combination of two interacting components or perhaps a fraction in some state of disaggregation or depolymerization. More recent studies using sedimentation or electrophoretic measurements have helped to clear up some of the earlier

confusion, but we have a long way to go before we can say that a complete characterization of the individual components of skeletal muscle protein has been achieved. Yet we must have this information before a thorough investigation of the changes occurring in meat during storage, processing or cooking can be made.

There have been many significant contributions made by biochemists which might be described as technical. Better and more efficient fractionation procedures have been developed for the isolation of the various fractions, and model systems have been devised to facilitate studies on them (Weber and Portzehl, 1952). One example of such work will serve to emphasize the significance of this type of approach. A series of reports by Mihályi and by Szent-Györgyi (Mihályi, 1953; Mihályi and Szent-Györgyi, 1953; and Szent-Györgyi, 1953) have established that trypsin initially splits myosin into two components, each of which has characteristic properties. These have been named L- and H-meromyosins or the light and heavy meromyosins. Further tryptic digestion of myosin eventually results in the production of non-protein nitrogen. Could this explain tenderness changes without the need for assuming that the only real evidence of protein splitting is the appearance of substantial amounts of non-protein nitrogen?

We ought not to overlook the classical paper of Hoagland et al. (1917), who found that after 30 days' storage of beef at 0°-2.2° C. only about 2% of the protein in beef was degraded to non-coagulable nitrogen. This suggests that drastic proteolysis does not occur in meat. How then does proteolysis take place? What kinds of change can we expect under different conditions? Surely these are some of the approaches to a study of meat proteins which we ought to pursue.

These remarks are not intended to imply that approaches to research endeavor in muscle tissue proteins are roads into a biochemical jungle. Muscle represents a uniquely complex tissue. We ought to give respect to its marvelous organization and to deal with it accordingly. One may tear up a cheap toy and quickly understand how it functioned when wound up. One would not want to proceed in this fashion in exploring the workings of a Rolls Royce engine, less so with a porterhouse steak!

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DR. SCHWEIGERT: I think you can see that we have a program of experts in protein research. The last speaker is no exception to this, and he, like Fred Deatherage, has been harnessed twice to serve the group here in sharing some things with you. We feel very fortunate at the Foundation to have such an outstanding friend and professional associate as George Wilson. I am pleased to call on George at the present time to share some remarks with you on some of our activities on protein research. George. (Applause)

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RESEARCH APPROACHES WITH MEAT PROTEINS

G. D. WILSON

AMERICAN MEAT INSTITUTE FOUNDATION

In listening to the speakers who have gone before me here this afternoon, perhaps Joe just summed it up about as well as anyone could. As for throwing a challenge out to us, I am sure that none of us here think for a minute that we are anywhere near the end when it comes to investigating meat protein or any other type of protein. But I think that Joe has thrown the challenge to us and has brought out some of the technics that need further investigation at some time, and let us hope that not too far in the future very significant contributions will be made in the way of meat tenderization, and another area that is not unrelated is the moisture retention of meat products. This latter subject is one in which we are vitally interested at the Foundation. This is a problem in the meat industry, particularly in the meat packing industry where they are extremely conscious of yield even though it be in terms of .1 of a per cent.

In going into a program of research relating to moisture retention in products, we are very aware of the number of controls that we must have on any experiment we do, and in many cases it is very difficult to have adequate controls. Within the last year we have made a move in the direction of making some contribution to the water-binding properties of meat and at the present time we have one Ph.D. on this problem full time.

As I mentioned a moment ago, a multitude of approaches might be taken to a study of this kind. One thing that has interested me personally for a few years, going back to when I was at Wisconsin, and it still intrigues me and others, too, is the distribution of intracellular and extracellular water. I don't think we can make the assumption, when we speak of drip in meat or the juice lost in the processing of canned meats, for example, that this is entirely extracellular water but it would seem logical that extracellular water would be much more easily lost than intracellular water. In looking into this problem further, I think one of the big problems we have is adequate measurement of this property of meat.

Some classical dye methods are used. They are primarily adapted to living animals as for knowing about the distribution in the body. We are working on some approaches to this problem and, of course, this is only a small segment of it.

With adequate methods of doing this, then the immediate question comes up how do these ionic shifts that Dr. Deatherage was speaking about affect these or is there any effect? Furthermore, going from there you can think in terms of using semi-purified preparations and, as Dr. Deatherage has brought out, of studying these effects of ionic shifts under those conditions.

One method along this line showing considerable promise is the one that Dr. Clegg has so adequately covered this afternoon.

In dealing with the water-binding properties of meat we can say that one piece of meat has a higher yield than another. That is really about as far as it goes. We know that the ph. will have an effect on it. We have actually a commercial application of that in the use of phosphates in meat. To go much beyond that we really don't know the intricacies of the thing we call the water-binding of meat.

One method that we plan to use along the line of the tube method of Dr. Deatherage (it is very imperical) is moisture-vapor determinations on different kinds of meats. We hope to be able to do this under various conditions and to use this as a tool for measuring moisture retention.

One last thing that I should like to mention -- and it was touched on this morning -- as far as research in meat protein is concerned hinges around aging. I believe Dr. Wang made reference to this. We are very much interested, as everyone here is, in the enzyme system present in meat. Extremely little is known about this subject. Enzymes themselves are very complicated in most cases as to what happens when outside effects are brought to bear on them.

Whenever I think of this subject, I recall that at the time of my preéntrance at Wisconsin, Dr. Phillips, whom many of you here know, asked me to tell him what I knew about the enzymes of meat. I just gave up and I was thankful that I did, because I don't think he knew very much more about it than I did. I give all due credit to Dr. Phillips, but as to a really basic understanding, I think that is true.

This is an area in which results in all probability will be slow in coming, but tied together with our other programs on meat aging, it is a very important and necessary part of it, and we hope that through integrating these various programs we will be able to make a major contribution in the field of meat tenderness.

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DR. SCHWEIGERT: Well, I see that we are right on schedule with all four of our formal presentations, and we are going to have some discussion. I should like to make just a few summary points first. That is, I hope you have begun to know that some of the modern tools in allied disciplines, particularly the physical biochemical, on problems of meat research are being brought to bear more and more at various institutions, either through collaborative efforts, through the addition of staff members to existing meat research groups or to food technology departments, or to similar organizational structures, at our various universities, experiment stations, research institutes, etc., and that we see much more of this type of application rather than the approximate analysis type of

approach, which has the extreme value that the difference associated with tenderness, for example, which may be merely reducing the size of the macromolecule by one-half, which is not reflected by an NPN determined by any of the usual criteria used before, or by structural change, will be evident, and we are developing and utilizing some of these new tools of minimum molecular weights, etc. to get at some of these answers.

Also I can tell you that Dr. Doty, of the American Meat Institute Foundation is studying enzymes of muscles, and we hope to get a few findings in the course of the investigation.

We have some time for you gentlemen to release some suppressed questions related to this morning or this afternoon. We will find somebody who can comment on them for about ten minutes, or if somebody would like to share some new approaches on proteins that we did not cover in these presentations we would like to hear from him. This is your opportunity to put democracy into action right here and now.

If we cannot stimulate anybody to get started, I have one question to ask Fred. Fred, I noticed that in the infusion experiments with salt you got a marked increase in tenderness. What would infusing with water alone do?

DR. DEATHERAGE: Nothing.

DR. SCHWEIGERT: Thank you. That ought to start something.

DR. DEATHERAGE: That was reported in 1954.

DR. SCHWEIGERT: Yes, sir. I just wanted to get it generally shared.

Lyman, you have some good protein research at Michigan State, some on heat pigments and otherwise. Do you have some comments to make?

DR. BRATZLER: We are particularly interested in the color mechanism related to the color changes in frozen meat, and Congdon who is doing the work is not here today. That is our main interest at present. We don't know whether we are going to make any contributions but, of course, we always have hopes.

Al Pearson, if you are here, do you have anything to contribute?

DR. A. M. PEARSON (Michigan State University): I don't have anything to say. I am going to counter a question by asking Dr. Wilson - I noticed that he was speaking of inter and extracellular water. By that was he referring to bound and free water in essence or just distinguishing between the two?

DR. WILSON: I was trying to distinguish between the two, but whether that falls into bound water or loosely bound water or free water that is just exactly what we would like to find out, that is, what we are measuring when we use these methods of determining bound water.

I should like to ask Dr. Deatherage another one, if I may. You just gave Bernie a negative answer to his question on water. There is a method that has been used -- it may not be successful and, if so, there really isn't much point in my question. It is fat infusion into carcasses with which I know you are familiar. This morning you made the statement that fat plays no part. It is reported that these carcasses that have fat infusion are more tender than their controls. If you look on water as a physical effect at least you may think that fat might have a physical effect, too. You have ruled that out. You ruled fat out this morning. Can you give another answer?

DR. DEATHERAGE: Well, in the first place I think I would want to see the data on the fat that they were pumping in. I might say that what they included in their fat might play a part. Anything that will change the scheme of things. In other words, I gave no as the answer to water. Again you might say that I would have to backtrack in a sense when you ask, "Well, can I put anything in the water to carry it along?" you see. By the same token I think we would have to say the same thing about fat. I have had no primary experience with it. I only know what the advertisements have said. In other words, I should like to see the data before I make a statement.

DR. SCHWEIGERT: You can never argue with that approach, but I see that it has stimulated a few hands.

DR. SCHULTZ: I should like to ask if anybody knows of any comparable work to that on beef, beef muscle particularly with pork or lamb. There might be some inherent differences in the structure or the composition, physiologically or otherwise, that might give us some leads. I wonder if any work is being done along that line.

DR. SCHWEIGERT: Do you mean in infusing fat?

DR. SCHULTZ: No, just examining pork muscle as being inherently different from beef.

DR. SCHWEIGERT: I just throw this out. There are tenderness problems with pork in case anyone thought there weren't.

MR. PEARSON: I am not attempting to answer the question here because I don't know. Somebody else may have information on that. What I am thinking about is the original work where they studied ice crystal size in frozen beef, pork and lamb in Australia, in about 1936, I think, Victory, Love and Jones. They observed quite a difference in the ice crystal size, and at that time they suggested that that was tied up with the relationship with which the water was bound to the actual cell itself.

DR. SCHWEIGERT: Very good.

I think we will close by asking O. D. if he has anything he would like to report in this area from his institution or with reference to the fat question or anything else.

DR. BUTLER: I appreciate the attention, but I don't believe I have anything to add.

DR. SCHWEIGERT: Thank you. We appreciate the opportunity to share this program with you. (Applause)

CHAIRMAN BLUMER: Thank you, Bernie, for these very informative papers and discussions on meat proteins.

We will take a 10-minute break at this time, and please get back quickly at the end of that time.

(Recess)

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CHAIRMAN BLUMER: In order that we may give the conference members time to think about a conference chairman for next year and also to facilitate the counting of the ballots, we are going to turn our program now over to the Chairman of the Nominating Committee, who is Dr. J. J. Wanderstock, of Cornell University.

DR. WANDERSTOCK: Our committee had a very difficult task drawing up a list of nominees, but we have finally been successful in gathering a list together because two of the members are not with us today and so that left only three of us to haggle about who should be nominated.

As you will recall, our constitution says that we are obliged to nominate three members of the present Executive Committee and from those three members we elect two. The constitution also says that we should draw up a list of five additional members, nominees, from which we will elect three. So these are the nominees drawn up by the Nominations Committee.

The three holdovers are Vern Cahill, Gene King, and Zane Palmer.

The five "new" people, using "new" in quotes, of course are Charley Adams, Bob Deans, Bob Kelly, Don Naumann, and John Pierce.

Now what we are going to do is to vote for two in this column and for three in this column.

I should ask if there are nominations from the floor. I guess the constitution reads that nominations will be welcome at this time from the floor. Are there any other nominations? If not, we will assume that these are the only nominees.

I should also call your attention to the fact that only those people who are members of the conference are eligible to vote, so that guests cannot vote.

I should also call to your attention the fact that no more than five people can vote from any institution, and if my memory serves me correctly it seems that some of the institutions have more than five people present today. So will the institutions having more than five people present please get into a confab to decide who should do the voting? How many institutions have more than five people present?

DR. SCHULTZ: Let me vote five times.

DR. WANDERSTOCK: Dr. Schultz is voting five times. I guess that is his prerogative. No institutions with more than five people present? There must be several. The AMIF and the USDA. How about Wisconsin, Missouri or Michigan?

DR. BRAY: We have our full quota of five.

DR. WANDERSTOCK: Fine! Now we will pass the ballots out.

(Balloting.)

CHAIRMAN BLUMER: Thank you very much, Jerry.

Now we will pick up where we left off, and I will ask Lowell Walters, Chairman of the Meat Judging Manual and Contest Committee, to take over for his committee.

DR. L. E. WALTERS: Thank you, Tom.

Ladies and Gentlemen: In spite of the fact that all in the room are not directly connected with the proposition of meats judging teams, I think there are some very interesting items of business to come before the group this afternoon. And to start our phase of the program off we are very happy to have with us this afternoon a fellow meat judging team coach who has, since our last meeting, ceased to be a member of the group as a meat judging team coach. We are very happy to have him with us this afternoon. He has a special report to make to the group. I should like to call on Ralph Soule, of Charles Pfizer and Company, at this time to make his report.

DR. RALPH SOULE, JR. Thank you, Mr. Chairman, General Chairman and Members of the Conference: I guess this is the grand finale for me, but I do want you to know that I am still doing a little meats work. About a month ago we had our annual research conference at Terre Haute and we had a meat type hog demonstration. During the planning of the conference last January I thought it would be interesting to the feed manufacturers if we showed them what the problems are with the meat type hog in the swine industry and I had Breidenstein come down -- I think he is here today--and spend the day with us.

Then we had a Press Day and I put on another meat type hog demonstration, and the press liked it so well that the "Industry on Parade," which is on Friday nights at ten o'clock, in a couple of weeks will come down with all their paraphernalia, truck, etc. and we will put on a demonstration for them. So I haven't left the field entirely.

Now what I am going to present here isn't my idea or the idea of the company, but we are all for it 100 per cent. I think a lot of you fellows who know Davie Mackintosh as well as I do know that he is always thinking about the underdog, and I know that in Kansas he is always thinking about scholarships for the 4-H Club, the FFA and groups like that. When the Kansas Livestock Association was interested in the promotion of beef, etc. I remember him bringing it up, and he was responsible for a scholarship. I forget now whether it ever went through or not. But last fall in just a general convention with Davie and Bob Henrickson they mentioned that they would like to have something for the meat judging teams at the time of the contest at the time they are giving the awards. They did not go too much into the details of the mechanics of it, and just generally talked about giving some prize money to the winning meat judging teams and maybe to individuals. They were not quite sure just what the mechanics should be. That is something, of course, for the coaches to work out.

Naturally when a person is asking for money to give away he always asks for a lot more than he expects to get, which I did. I wrote a two-page letter to the board of directors. They are all members of the company and so one gets to know them quite well. I told them about the meats judging teams and about the intercollegiate meat judging contest in Chicago, something they had never heard of before. They didn't even know there are meats departments in the colleges. All they knew about were the nutritionists. So I told them what you are trying to do and when I talked to them I emphasized it like I am talking here now.

Lo and behold I got a letter, but the amount was cut in half. So I said that would not do and I had to have more money than that. I talked to Gene King. I met him at a meeting down in Texas, and I went back home and I said that I had to have more money than that.

So this is what we have come up with, and I have talked it over with Ken Franklin, and with some of the coaches.

It would be called the Pfizer Meat Research Annual Award or you can shift those words around any way you want to do so. You wind up with $1750 regardless of what the title is. You may want to work out something different, but tentatively now the winning team would be presented a check for $1,000 made out to the institution that it represents. For instance, using a hypothetical example, if the University of Idaho were to win next year at the intercollegiate, they would receive a check for $1,000 made out to the animal husbandry department and they would bring it home to be used for meat research.

We would have no regimentation whatsoever as to what would happen to that money. I know what happens to some money that comes in. They use it to buy hay, fences, etc., but we would have no regimentation. It would be up to the honor of the head of the department to see that the fellows doing the meat research in the department and the department use the money judiciously for some phase of meat research. It could be used on proteins if they wanted to or to buy some of that gelatin.

Then the second team would receive $500 and the third team, $250. I know that sounds kind of small. You cannot do much with $250 but it is something anyway.

It is divided up $1,000, $500 and $250 which makes a total of $1750.

That money would be awarded at the International the same as breed associations give prize money for the champion bull or heifer, etc. I don't think that I am quite high enough up the ladder to have the pleasure of presenting the checks myself. They will probably have to have some executive come in and present them. But it is money regardless of who presents them.

That is all that I have to say. Lowell or Ken Franklin, if you think there is something that I can add, speak up. Is there anything that should be added?

SECRETARY-TREASURER FRANKLIN: No, I don't think of anything, Ralph. I think the folks should discuss it.

DR. SOULE: Well, that is all I have to present. Thank you.

DR. WALTERS: Ralph, thank you for that fine and very interesting report. We are very glad to see that you are still interested in meats work, and on behalf of the coaches and on behalf of the Reciprocal Meat Conference, I should at this time like to express our sincere thanks and gratitude to you and to your company for this very fine gesture, which I think is certainly one of the most splendid acts that has come before the meats judging coaches group in a long, long time.

For ciscussion of this proposal I should like to call on Gene King.

MR. G. T. KING (Texas A. and M. College): I don't know that there is any point in my elaborating on what Ralph and Lowell have so ably stated here. You have heard Ralph's offer on behalf of Pfizer and Company, and I think it is a wonderful gesture.

Since the winning teams seem to dominate somewhat over the years, it might be very well to put a little clause in there that a team cannot win it two years in a row or something like that to let some of the rest of us poor fellows down the line get just a little of what Ralph is passing out.

I should like to throw it open to discussion from the floor. Are there any comments from anyone in the audience? Pros or cons?

DR. R. J. DEANS (Michigan State University): I speak for Michigan State University. If I don't, you stop me. I think there are undoubtedly pros and cons to this. I should like to say that I don't know how necessary it is, Ralph, that this be divided in this way. I personally should like to see, perhaps because during my experience with the Michigan team we haven't been too high, this money spread maybe over the top five teams, I can see merit in that. As we all know, frequently not too many points separate the top three and many times it is a very close decision. I personally would favor a little broader distribution, if you are going to have the awards.

DR. HENRICKSON: Just a little in rebuttal of that and also maybe to help Pfizer and Company. This is being given for research purposes, and

if it were distributed five ways, I believe there would be very little for research at any one school. A thousand dollars isn't very much either to get it started, but when it is put with what one already has it helps. It would help to support a graduate student or to get some work under way. I question just how much good it would do if it were split five ways.

DR. PALMER: I should just like to bring up the point, if the top student is not interested in graduate study, could a way be worked out for the money to go to the high man who wanted to undertake graduate study? That might pose a problem.

MR. GLENN KEAN (Pennsylvania State University): I don't know whether any other school operates as Penn State does as far as this is concerned. If we should happen to come home with a thousand dollar check some time it would be embarrassing, because we have to get the board of directors to approve any grant that we get or any gift before it can go into the fund to be used for research purposes. I don't think there is any question they would do it but it is a responsibility. When you receive a grant you have to sign all kinds of releases, and so on. You might think about something like that. It gets into the college fund all right. You can get it down there, but you can never get it back.

DR. E. A. KLINE (Iowa State College): This Pfizer award has been discussed a little. If it were stipulated that the money is to be used for meats research, would that clear it through your chancellors as far as the general kitty of the college is concerned, if it were earmarked for meats research and not just for research? I realize your question, Glenn, and I wonder if that would clear it.

MR. KEAN: Let me say I don't think there is any question it could be done, but it could be conceivable in our case and I think in some others. Dr. Butler can give you a little more information on that. He has had some experience with administration. It is pretty easy to accept money down there, but unless the director of research, and so on, have all approved it, the check might lay around and then Pfizer might say, "If they don't want the money we won't give it to them."

I would think it would be much more profitable to go along with Dr. Palmer's idea of giving it to the student to carry on graduate work. I think Dr. Butler can elaborate on this from an administrative standpoint. Maybe they don't have the same problem that we have.

DR. BUTLER: We have the same problem that any grant has to be accepted by the board of directors. I think that Mr. Kean has a fine idea there. Probably the main thing we are trying to do is to encourage students to do graduate work, and if it could be set up on a fellowship basis it would go through different channels at our institution and the men would get the money.

MR. KING: Is there further discussion?

MR. D. L. MACKINTOSH (Kansas State College): Mr. Chairman, I think one of the ideas back of the suggestion that it go to the department rests in the fact that from time to time the top individual or the top three

individuals in the contest might not be men who are interested in research work or might not be qualified for research work. The idea was to give it to the school for a scholarship, to be used by the individual who is interested, selected by the department, and it would be an aid in securing the services of some deserving individual.

MR. KING: There would be no administrative strings then.

DR. BUTLER: No. Different channels.

MR. W. J. LOEFFEL (University of Nebraska): Mr. Chairman, I think there has been enough discussion, so that the committee knows the feeling of the group, and I move that the matter be referred to the Meat Judging Committee, giving them power to act.

MR. ELLIS PIERCE: I second the motion.

MR. KING: Any further discussion? All those in favor of the motion say aye; opposed the same sign. The motion is carried.

DR. WALTERS: Thank you, Gene.

The next item on our agenda is the reading of the minutes of the last coaches' meeting. I should like to call on Professor Kline, of Iowa State College, to read those minutes at this time.

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COACHES MEETING

DR. E. A. KLINE
IOWA STATE COLLEGE

The annual meeting of the Meat Judging Team Coaches was held at the Armour & Company Auditorium in Chicago, Illinois, on November 27.

Chairman Lowell Walters called the meeting to order at 8:45 A.M. Twenty-eight were present.

The first item of business was a discussion of the National Beef Cattle Classification and Grading Contest scheduled for April 17 through 19, 1957, at Omaha, Nebraska. This contest is to be sponsored by the Color Television Center KMTV and The Omaha Livestock Industry. This contest was presented by Dick Robertson to the coaches at Kansas City in October. At the Kansas City meeting, Mr. Walters appointed a committee to work with Dick Robertson in drafting a proposal for such a contest. The committee consisted of Professor Loeffel, chairman, Jim Kemp and Ed Kline. Jim Kemp and Ed Kline reported on the tentative outline of this contest.

Charles Adams suggested that the eligibility rules for this contest be the same as for the Meats Contest. "Woody" Aunan was opposed to the large sum of money for individual awards and suggested that the greater part of this might be used for travel money (on a mileage basis) for teams participating. Also he suggested that the National Livestock and Meat Board should be a co-sponsor of this contest. Professor J. W. Cole suggested that hogs be used as well as cattle. Gene King commented that a phase of carcass grading be used as well as live evaluation. Tom Blumner asked if this contest would eventually replace the meats judging contest. Ken Franklin stated that to his knowledge the Meat Board had not been asked to cooperate with the project as yet. More discussion followed in regard to the contest and governing body for this contest, rules and regulations, etc.

"Woody" Aunan moved that we take a vote to see how many would be in favor of the idea of a contest of this kind. The motion was seconded by Gene King. The vote was: Yes 9 - No 9.

Don Naumann moved that this tentative outline be given back to the committee for further consideration and modification. The motion was seconded by Glenn Kean. The vote was: Yes 14 - No 4.

Zane Palmer moved that the committee consider the following proposals:

1. That the eligibility be the same as for the meat judging contest.

2. That the sponsorship of this contest be at least a three-way deal, including the National Livestock and Meat Board, and that the governing body be representatives of colleges, the Meat Board, and the industry or yards group.

3. That the contest involve cattle, hogs, and sheep, and in some way include carcass grading.

4. That all of the award money suggested not be used as awards, but the major part be used to defray travel expenses (mileage) of teams participating.

The motion was seconded by Don Naumann.

Discussion - "Hap" Wilder mentioned the National TV program and wondered if the group wanted to get involved in a contest for publicity sake. Charles Adams was not in favor of a contest unless the governing body be the coaches and the Meat Board, but was in favor of some type of mileage compensation and eligibility handled the same as for meat judging contests.

Palmer moved to amend the motion that the governing body be the coaches and the National Livestock and Meat Board. The consent of the second was given by Don Naumann. The motion, as amended, passed unanimously.

Zane Palmer moved that, due to the lack of time, we not accept a contest of this kind for 1957, but that we consider it at a later date. The motion was seconded by Wilder. The motion carried.

Chairman Walters appointed the following to work with the Omaha Group on this contest: E. A. Kline - J. D. Kemp - Lowell Walters.

Verne Adams raised a question in regard to a banquet for the Meat Judging Contestants. No action was taken.

Ken Franklin pointed out that the National Livestock and Meat Board would be sponsoring three live animal evaluation clinics this next year. The clinics to take place at Nashville, Oklahoma City and on the West Coast. He asked that institutions present and interested in attending the various clinics give him their choice of dates for these clinics.

Gene King moved that we adopt the following rules for our meats judging contest:

1. In the beef grading section - no separate grouping or division be made for cow carcasses. (Cow carcasses to be mixed in with steer and heifer carcasses.)

2. No handling of lean cut surfaces in beef grading, beef judging, and in the judging of beef cuts and pork cuts.

The motion was seconded by C. P. Wilder.

After considerable discussion, it was suggested that we vote on each part of the motion separately. Vote on part 1 - Unanimously in favor. Vote on part 2 - Yes 13 - No 7.

It was moved by Don Naumann and seconded by Glenn Kean that we adjourn. The motion carried.

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CHAIRMAN BLUMER: You have heard the reading of the minutes of the coaches' meeting. Are there corrections?

MR. JAMES D. KEMP (University of Kentucky): I move that they be approved.

MR. KING: Second.

CHAIRMAN BLUMER: They stand approved. May we have a voice vote? All those signify by saying aye to approve the minutes as read; opposed the same sign. The motion is carried.

MR. WALTERS: Thank you, Ed.

I should like to call on Ken Franklin at this time to give us a report on the live animal and carcass evaluation clinics which were mentioned in the minutes of the coaches' meeting.

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LIVE ANIMAL AND CARCASS EVALUATION CLINICS

KENNETH R. FRANKLIN

NATIONAL LIVE STOCK AND MEAT BOARD

Many of you know that the idea of correlating the value of the live animal with its carcass value was born here in this Reciprocal Meat Conference some five or six years ago. I don't want to dwell on its history because you either know it or can get it from the proceedings of conferences in past years. But I think this has already proven to be one idea that the conference can very well be proud of its contribution to the livestock and meat industry and to college education.

The Board has been particularly gratified in the past two years with the success of the clinics that we have sponsored in Chicago and Omaha. As you just heard, it was decided this year to take the clinic idea to different sections of the country, and three clinics were planned and held this year. Our first clinic was in Nashville, Tennessee, and a total of 12 agricultural colleges had representatives at that clinic. One hundred and twenty students and faculty members participated in the two and one-half days of the clinic. Our second clinic was held at Oklahoma City. Five schools were represented there, and some 70 students and faculty members. For our third clinic we went to an area of the country where we had not done much in the way of cooperation, to the western states. We held the clinic at Ogden, Utah, and while the college representation in numbers was not great, with only five schools participating, the turnout in student numbers was very good with another 70 students and faculty members.

Over and above that, I think the thing that has gratified us the most has been the keen interest on the part of these students and faculty members in all phases of the program.

Very briefly, for those of you who have not heard of the clinics, the program consists of the following:

On Thursday morning we exhibit a series of test beef cattle and hogs. We ask the students to evaluate them in terms of weight, grade and yield, and in the case of the hogs, backfat thickness. They have seen these animals on the hoof. They have heard the official committee give its opinion.

Thursday afternoon was devoted this year to more of the same work, but not on a test basis.

This year for the first time we inaugurated a carcass grading session on the Friday morning of the clinic, very similar to the carcass grading that is done at the intercollegiate meat judging contests. However, it was conducted on a much more informal basis than the contest.

For our Friday afternoon session once again we enlisted the cooperation of key speakers from the livestock and meat industry to acquaint the students with the potential value of employment in the industry and some of the challenges that will face them when they come out of school.

Saturday morning was devoted to an actual viewing of those test cattle and hogs they saw on Thursday morning and a comparison of their evaluations with the actual measured figures.

We have heard from a good many of the students who have participated in these clinics. We, of course, have heard from the faculty members, and without exception they have lauded it as one of the most interesting and educational field trips they have taken in their college days.

But I don't want for one minute to convey the idea that the Board is the only agency responsible for these clinics because they have been a cooperative venture. They are a lot of work, a lot of detail, and a lot of different people have had a good hand in helping with them, market interests and packing companies that have contributed their time and effort.

This year I should like on behalf of the Board especially to thank four gentlemen of your group who worked with us: Professor Bill Cole down at Tennessee, Professor Lowell Walters at Oklahoma, Professor Ed Kline out at Ogden, and our good friend John Pierce of the U.S.D.A. These men headed up the official evaluation committees. It was largely their responsibility to select the cattle and hogs, to carry through on the evaluation work.

Wherever the Board puts on a clinic we are going to be grateful to those of you who are close to the area whom we call on to assist us. We think that this is a splendid program. We intend to continue it. We will very likely conduct three clinics again next year, and, although the selection of the sites is not final, we will certainly welcome your suggestions and recommendations.

Our intention is to take this evaluation work and study of the industry to as many different regions as possible, so that when we are close to your particular college you may take full advantage of it with a large number of students.

We have found, as far as the program is concerned, that one of the chief values of these clinics is the fact that a good many students can participate. They can learn with an actual on-the-scenes demonstration.

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MR. FRANKLIN: Mr. Chairman, that concludes our report on the clinics, and if I may just pause and take a deep breath, I have another subject to discuss, one which I fear is not as pleasant.

Although it is not listed on your program this year, for the past several years we have been giving you a report on the status of the meat judging manual. I am very much afraid that I have to bring you a disappointing report again this year. The pork section of the judging manual is complete to the best of my knowledge. As far as the beef and lamb grading are concerned I am afraid we know nothing.

We at the Board are just as disappointed as you in the coaching ranks that this publication is not off the press and in use. We have allocated money for it. We should like to see it spent for the publication. Frankly, we don't know what to do, and we feel that it is a decision that must be made by the conference if we are to continue to hope to issue such a publication. I am sorry that I cannot give you anything more definite than that.

Mr. Chairman, I will throw the meeting open for discussion, if I may.

DR. WALTERS: Thank you.

Tom, will you chair the discussion?

CHAIRMAN BLUMER: Is there discussion from the floor?

MR. KING: I feel personally about this meat judging manual, since we have been about seven or eight years getting it, or attempting to get it, that we need to take more drastic steps than have been taken in the past and, with all due respect to Jim Hillyer, I know that Jim is busy, but we need a manual and we need it very badly. I think that we should approach Jim, and if he does not have the time and is unable to finish the publication, then I think it should be put into the hands of someone, one or more individuals who can get it ready and in print.

CHAIRMAN BLUMER: Thank you, Gene. Are there other comments in this regard?

DR. BUTLER: I have a pretty strong feeling about this. I think that is a pretty good idea, and that we should set a deadline and extract a promise to complete the manual by then and there should be alternative methods to be taken to assure the publication of the manual this year, if that deadline expires and the promise has not been kept.

I think that we are all looking for a very high class publication. We should like to see one that is perfect, but at this rate the revisions won't even keep up with what is written. So I think it is more important to compromise a bit and get something that is useful, that may be slightly imperfect, with the thought of revision later.

CHAIRMAN BLUMER: Thank you, O. D.

DR. H. D. NAUMANN (University of Missouri): In order really to get this moving along I make a motion that we empower the Meat Judging Manual Committee to take whatever action they and the National Live

Stock and Meat Board deem necessary to insure the publication of this manual by this time next year.

MR. KING: Second.

CHAIRMAN BLUMER: It has been moved and seconded that this be done. Is there discussion on the motion? All those in favor of the motion signify by saying aye; opposed by the same sign. The motion is carried.

I believe that the Nominations Committee is now ready to report.

DR. WANDERSTOCK: Our new Executive Committee consists of Vern Cahill, Gene King, Charley Adams, Bob Deans, and Don Naumann. Let's give them a hand. (Applause)

CHAIRMAN BLUMER: Congratulations to the new Executive Committee.

While we are on the subject, you can be thinking this evening about whom you would like for your new Chairman. We will vote on him at tomorrow's session.

(Announcements of committee meetings.)

CHAIRMAN BLUMER: So without further ado we will turn the floor over to the Chairman of the Consumer Research Committee, Lyman Bratzler. (Applause)

DR. LYMAN BRATZLER: I think you recognized this morning when we were talking about consumer preference that what the housewife tells us she wants or she thinks she wants is not always what she buys.

More or less to set the stage and to acquaint you and also the two speakers who are to follow, I think it is only fair that we, as college folks, tell what we are doing and what results we have obtained, in the hope that we can get some ideas as to how we can improve our experiments and also increase the validity of our results.

I want to say that the committee is all present with the exception of Dan Brady, and whether Dan is in Europe or on the high seas or in Washington, I don't know. It seems that he may be in any one of three places or perhaps in all three at once. I don't know how he is traveling these days. However, all the committee is present except him.

First of all, Gene Birmingham, of the University of Missouri, who is presently working on his doctorate degree, is going to bring us up to date on consumer preference studies - current projects and recent findings. Gene.

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PROJECTS AND RESULTS OF CONSUMER PREFERENCE FOR MEAT AND MEAT PRODUCTS

E. BIRMINGHAM
UNIVERSITY OF MISSOURI

My objective of this paper is to discuss with you what has occurred in the area of consumer preference for meat and meat products during the past year. I have listed on the sheet passed out to you the stations that are now actively carrying on research in consumer preference, the departments involved and the area of study.

STATE	DEPARTMENT	AREA
Arizona	Animal Husbandry Agricultural Economics	Beef
California	Animal Husbandry Food Technology Home Economics	Beef Lamb
Colorado	Animal Husbandry Agricultural Economics	Beef
Iowa	Animal Husbandry Agricultural Economics	Pork
Louisiana	Home Economics	Beef
Michigan	Animal Husbandry Agricultural Economics	Beef Pork
Missouri	Animal Husbandry Agricultural Economics Home Economics	Beef Pork
Oregon	Food Technology Agricultural Economics	Beef Pork
Texas	Animal Husbandry Agricultural Economics	Beef
Washington	Animal Science Agricultural Economics	Beef

First of all, allow me to review what has been done with regard to beef. Research in this area falls into several categories. We have:

(1) Consumer Preference of Frozen Beef at the Retail Level.

(2) Quality Factors which Influence Purchase of U.S.D.A. Grades.

(3) Motivation Factors Influencing Consumer Purchase of Beef.

(4) Economic and Technical Feasibility of Retail Distribution of Frozen Meats.

Now to glance at the highlights of these four studies. What does the consumer purchase when given the opportunity to buy Frozen beef? Michigan workers conducted a study which was designed to test the preference for frozen chuck roasts and round steaks. One group of each was treated with carbon monoxide to develop and stabilize color and then compared with the untreated frozen cuts. During the five week study the cuts were arranged in such a manner as to be statistically sound. Prices for the cuts were the same during weekly tests. Results indicate that the treated steaks and roasts were selected one and a half times more often than the untreated or you may say they were at least equally or more acceptable. Some of the comments noted by the investigators were:

1. It was difficult to maintain an attractive display.

2. Both treated and untreated cuts developed appreciable internal frost due to cycling and defrosting of the case.

Several stations are working on the quality factors of beef as relates to consumer preference of U.S.D.A. grades. Oregon state is now conducting a study using 3-D color pictures of rib roasts, arm roast, round and sirloin steaks from 12 carcasses in each of the five U.S.D.A. grades. Chemical analysis, organoleptic studies and physical measurements have been made on all cuts. These 3-D color photographs are now being shown to approximately 10,000 consumers in Oregon. From the results, these investigators hope to be able to determine the quality factors which motivate the consumer purchase of beef. They hope that the results will be of value to the producer and processor of beef in Oregon.

Workers at Arizona, California, Colorado and Texas find that there is a decided preference for U. S. Good beef as compared to U. S. Choice. In the Houston survey the following conclusions were made:

1. Beef irrespective of price, is at present the preferred meat of only about 60 percent of the Houston families.

2. Chicken is the major competitor of beef, partly as a result of the tremendous growth of the broiler industry in Texas.

3. Medium and low income families are inclined to shift their meat preference away from beef and toward chicken instead of veal.

4. Preference for veal is very low among low income as well as high income families. Veal preference is also quite low among Phoenix, Arizona, and Denver, Colorado families.

5. U. S. Good grade beef is preferred by most consumers, even if U. S. Choice and U. S. Prime are the same price per pound in the retail store. This was the consumer's decision after viewing 8 x 10 colored pictures of U. S. Commercial, U. S. Good, U. S. Choice and U. S. Prime beef rib-eye cuts.

6. U. S. Prime beef is the least wanted of all meat grades, even if priced the same per pound as lower grades of beef.

Forty one percent of the Phoenix housewives selected cuts from the U. S. Good grade as compared to 32 percent for U. S. Choice and 27 percent U. S. Commercial.

Louisiana and Missouri station workers are currently investigating the motivation factors influencing the consumer in purchasing beef. It is hoped that these findings will serve as guides for the revision of marketing processes and practices and for the establishment of a more pertinent meat education program.

To obtain the current facts concerning frozen meat merchandising and the attitudes of retailers, Missouri has conducted a sampling study of 80 small independent stores and 45 large (annual sales over $250,000) independent and chain supermarkets. The divisional frozen meat merchandisers of several chain and cooperative wholesale organizations have been interviewed.

Preliminary results indicate that frozen meats obtain only about 2 percent of total frozen cabinet space. Moreover, frozen meat sales are considerably less than 1 percent of fresh meat sales.

Convenience is listed as the chief reason why consumers purchase frozen meats while prices, quality, and the lack of sales promotion are the principal reasons why sales are not larger.

While the amount of frozen cabinet space is slowly increasing, the entry of many new frozen products (particularly pastries) has intensified the competition for display space.

Small retailers are generally indifferent or even opposed to frozen meats. There is greater interest among merchandisers of the larger firms, but there is little enthusiasm about either the price or quality of most frozen meats now marketed. The consensus appears to be that very little more of their scarce cabinet space will be allocated to frozen meats until they show a return comparable to other frozen products.

Pork studies, while few, do try to determine the characteristics of the grades and consumer preference for certain cuts. At present we have two areas of interest. They are:

(1) Consumers' Opinions of Quality in Pork Chops

(2) Economic Significance of Pork Grades in Relation to Consumer Acceptability and Preference among Retail Cuts.

Michigan state conducted a survey which studied the following variables of pork chops:

(1) general quality: no defect
inferior-marbling, size of eye, color and firmness.

(2) fat covering

(3) color of lean

(4) location of chop

Tentative results indicate that consumers are not aware of the quality difference in pork on a visual test.

Iowa workers conducted a survey to observe preference for center cut chops from U. S. No. 1, 2, and 3 pork carcasses and to learn the size of the chop desired by consumers. Observations noted are similar to Michigan findings--that is, consumers seem to like a darker color fresh pork meat which we associate with high quality. Consumers also prefer about the eighth inch fat cover on chops.

Another study involving pork sales was conducted by Missouri using over nine thousand hams and approximately eight thousand pork loins. The study was designed to measure the relative sales of "lean" and "regular" grades of these pork cuts when displayed in a comparable manner.

The product was obtained from a midwestern packer and was merchandized through fourteen stores of a retail grocer chain in June and July, 1956. Hams and loins were selected from carcasses of known backfat measurements.

The grading of the cuts was based upon the proportion of intermuscular fat at the blade end of the loin and at the cut surface of the ham between the center and shank portions.

One of the most significant findings is the relatively low proportion of "lean" cuts from the Medium and U. S. No. 1 pork grades.

Distributions of Hams and Loins from Pork Carcasses

Pork Carcass Grades	Hams		Loins	
	Lean %	Regular %	Lean %	Regular %
U. S. Medium	61.2	38.8	64.0	36.0
U. S. No. 1	47.5	52.5	53.3	46.7
U. S. No. 3	34.8	65.2	28.8	71.2

In general the "lean" products sold as well as the regular when priced higher indicating that about one half of the shoppers were willing to

pay a four cent premium for lean pork. When priced the same the lean cuts sold faster. The ratio of "lean" and "regular" sales of ham shanks increased throughout the period as shown by the following ratios:

Dates	Shank Lean: Regular Sales
June 11 - June 24	0.93:1
June 25 - July 8	1.02:1
July 9 - July 22	1.23:1
July 23 - August 5	1.41:1

How now can these results be put to an advantage? What are some of the practical applications for these research results?

With the beef studies we may best utilize the information by the following:

(1) They may serve as a guide for producers and processors. Someone must start the "ball rolling". Why create a waste when it can be avoided?

(2) Some type of incentive must be applied to obtain lean beef and pork for the consumer.

(3) More consumer education is needed concerning quality of meat on fresh and frozen basis--a packer and retailer problem.

(4) Special merchandising of slower moving cuts may move them at a better advantage.

We must provide the consumer with the kind of red meat she wants or she may revert to purchasing chicken like some of the Houstonians.

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DR. BRATZLER: Thanks a lot, Gene.

If you will jot your questions down as you think of them and will hold them, I am sure that we will have some time to answer them at the end of these talks.

You will notice on your program that Mr. T. R. St. John, of Armour and Company, was scheduled to present the material on means of strengthening consumer preference studies - packers' appraisal. In his stead we have his able assistant, Mr. F. C. Klasing, who is Assistant General Manager of the Beef, Lamb and Veal Division, which is a nation-wide division as far as Armour is concerned.

Mr. Klasing was formerly in the auditing department. He has had thirty years experience in the meat packing business. In spite of our consumer preference studies and what we find out, after all the packers, of course, do play a very important part. They cannot just sell the lean; they have to sell the fat chops and the beef along with it.

Mr. Klasing, the rostrum is yours. (Applause)

MR. F. C. KLASING: Mr. St. John sends his regret at not being able to be with you today. He was called to Texas this morning (laughter), and I would say that by this time he is listening to a Texan. I hope that it turns out to be a good deal.

It might seem a little odd that an individual connected with the comptroller division of the company, in the capacity of accountant, office manager, traveling auditor and general auditor over a long period of years would find his way into the sales division. It is strange. However, it seems that our livestock buyers pay too much money for the livestock and our salespeople fail to sell the dressed product for enough money and we wind up with so little profit they have an individual like me in the division more or less to guard the little that is left. (laughter)

Now I will get on with my section of the program.

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MEANS OF STRENGTHENING CONSUMER PREFERENCE STUDIES

F. C. KLASING

ARMOUR AND COMPANY

Every morning when we open up for business in our Beef Division, we have a new consumer preference survey before us in the form of our orders and the offers to buy which come to us from all over the United States. Our orders, presumably, represent what our customers want and our customers, presumably, order what consumers want.

We know, however, that everything is not as simple as that in the Beef business, and it is a privilege to meet today with you people who are trying to do something scientific and constructive about determining what the consumer wants in the Beef line. I have been asked to comment on means of strengthening consumer preference surveys, and I shall try to be as helpful as I can.

I know I do not need to tell you that we are dealing with a very complicated set of facts. And you may or may not know that we are also dealing with fancy as well as fact -- prejudice and established habits which may have historical roots going back for hundreds of years.

As to the facts in the picture, we regularly quote prices on more than 150 items of Carcass Beef, excluding canners and cutters. This total is arrived at by multiplying the different grades of Beef by the different weight averages, and then by the sex classifications - steers, heifers and cows.

We do all of the work of sorting and classifying because we find it necessary in filling our orders. Most buyers for a retail store or group of stores have quite a narrow range of preference in the Beef they like to buy. For example, we have buyers who would prefer to buy nothing but low Choice steers weighing no less than 600 pounds and no more than 650 pounds.

But meat is sold at wholesale and retail on very narrow margins, and every wholesale buyer realizes that he cannot afford to run up the price of a very narrow segment of the total Beef supply and let his competitors buy other Beef carcasses at substantially lower prices. So, what happens?

The buyers yield in their preferences as much as they have to in order to get the Beef they need for their stores. The man who prefers heifers may buy some steers; they may change their ideas on weight averages a little, and they may buy other grades than they customarily order.

The net result is that practically all of the millions of pounds of Beef produced every week gets sold to someone at a price. We don't have cooler space to hold the Beef over - it shrinks in weight, it loses its bloom, and it has to move.

Our concern, as the owners of this Beef, is to sell each kind, grade and weight in the market where it is most in demand and where we can get the best price for it.

For many years we have known that there was a great variation geographically in the demand for Beef. Cattle we ship to Boston, for example, have to be well-finished and heavy. The trade doesn't want anything lighter than 600 pounds and carcasses weighing 800 pounds and over sell well. They want steers in that territory and they don't have much use for cows or heifers.

When you get North of Massachusetts, however, there is a sharp change. They want big, heavy, lean commercial grade cows in Northern New England.

Elsewhere on the Eastern Seaboard, the preference is generally for better grades of steers, but less heavy than in the Boston area. This preference prevails until we get on the Southern side of the Potomac. Lighter Cattle and lower grade Cattle are more popular in the South. There are Southern markets where the most popular bovine meat is probably closer to Veal than it is to finished Beef.

A few years ago we thought we would get a line on the geographical Beef preference picture from our Sales Managers. We sent questionnaires to about 250 of them, asking that they tell us what kind of an assortment of Beef they would like for sale in their territories. They know, of course, that we have to buy the Cattle which come to market, and we aren't in a position at any time to give every Manager the exact assortment he wants.

The replies to these questionnaires told us several things we already knew, and several things that were quite surprising.

For one thing, there is some demand in all territories for each grade of Beef from Choice to Commercial, and for steers, heifers and cows, even though there are wide differences in percentages. Weight averages are a real problem in many markets. Some simply will not take very heavy Cattle and some will not take very light Cattle.

Another discovery was that it is impossible to take a broad region in this land of free-swinging opinions, and say something like the "trade in this state prefers this or that kind of Beef." In most of the markets of the Middle West, the trade wants medium weight Cattle which are not too bad as regards finish, and not too good either. Yet there are numerous markets in the territory which are a long way from conforming to this pattern.

What is back of these geographical preferences? Certainly money is important, but custom and tradition may be more important. A study entitled "Consumer Expenditures for Meat by Cities" was made a few years ago by the Bureau of Labor Statistics and published by the American Meat Institute. It showed that Beef expenditures per housekeeping unit ranged from $56 in Birmingham to $133 in Newark, N. J.

I doubt whether Birmingham is the lowest in per capita income of the cities surveyed and Newark is probably not the highest. Furthermore, the

percentage difference in expenditures for Beef demonstrates that the people of Birmingham just do not like Beef as well as the people of Newark.

Some people believe that the difference in consumer preference between Birmingham and Newark goes back to the days before refrigeration. In the hot, Southern climate, people relied much more on cured, salted meats than on highly perishable fresh meats. Also, it is a well-known fact even today that demand for cured and processed meats is higher in proportion to fresh meats in hot weather. Is this simply because processed meats require less cooking and the kitchen is kept cooler, or do we crave additional salt in Summer and eat processed meats in order to get it?

There can be no doubt that causes, other than price, influence consumer preferences in meat.

In considering the Boston and New England Beef demand, it has been suggested that until 60 or 70 years ago, most of the Beef for New England cities came from the surrounding farms. They raised big Cattle. They fed the steers and heifers until they were fat and then drove them to the city markets So, people in the cities became accustomed to fat, heavy Beef and they still demand that type of meat.

Meanwhile, in rural New England, there was probably an inclination to consume locally the Beef which was less suitable for city markets. So they butchered older cows and, perhaps, work oxen. This historical background may have some bearing on the fact that heavy, Commercial grade Cattle sell well in Northern New England today.

In the pre-refrigeration era, the old South, as you know, was cotton country. There weren't many Cattle and not much to feed them. Hardiness of Cattle against heat, insects and parasites was a more important quality to the Southern farmer than good Beef breeding characteristics. The result was a small supply of Beef per capita and the Beef averaged to be low in grade. While more and more better Beef is being shipped into the South and local herds have been greatly improved, much of the traditional pattern still remains.

Why are light Cattle with moderate finish preferred by many in the Middle Western markets? You may have read that smaller families, living in apartments, want small cuts of Beef from light weight Cattle. But families are no smaller in Minneapolis than they are in Philadelphia, and it is probable that about the same percentage live in apartments.

The "small family" explanation of consumer preference for lighter weight Cattle can't be the whole answer. It is more probable that the demand for lighter weight Beef in some markets is founded on long established habit. And, of course, lighter weight usually means less finish in meat animals.

In the over-all, it is apparent that more and more consumers want good eating Beef, with principal emphasis on tenderness, a Beefy flavor and with little or no fat.

We could go on to demonstrate that consumers preferences for Beef are quite well established in different communities and that they are quite complex. Here is the result of those preferences, translated into dollars.

(Chart)

This chart covers average prices of the four principal U. S. Government grades of Beef for the 1955-56 meat producing year. We started the year with a spread of only 7 to 8 cents a pound between the highest and lowest grades of Beef. At one point in early Summer, the spread from top to bottom was only about 6 cents. On the other hand, there were weeks when the price difference was about 20 cents.

There were short periods when the Prime and Choice grade price lines almost collided, and there are a couple of spots where the Good and Commercial lines come very close. A careful search will reveal occasions when some grades went up in price while others went down. Generally, the prices of different grades move up and down together, but at much different rates.

These fluctuations in prices are a burden to everyone. Even though we packers own a lot of Beef at all times, we don't like to see prices start up sharply as they did last July, because we know they will inevitably go down, and we will have to take some losses on high-cost product. You might say that producers of Prime and Choice Cattle who sold in September benefited by the prevailing high prices, but the reason a few of them benefited was that only a few of them had any finished Cattle to sell.

Any research, therefore, which throws light on <u>why</u> these fluctuations occur and what can be done to develop more stable markets, will benefit producers, processors, retailers and consumer.

For one thing, I would like to know what kind of a job our industry is doing in distributing America's meat supply to the markets where each item is most in demand. Not only is there little data available on what the consumers in different markets actually want, but I do not know of any data showing what they actually get.

The packing industry goes to a lot of trouble and expense in maintaining a distribution system designed to meet consumer preferences everywhere, and thereby obtain the highest dollar return available for livestock coming to market. Maybe we do too much - maybe we don't do enough - and maybe our methods could be improved.

When you look at the Beef price chart for 1955-56, it seems to be divided into two parts, as well as four lines. I mean, of course, the upper grades of Prime and Choice, and the lower grades of Good and Commercial. There is no chart demarcation, but it just seems to be there, both on the chart and in day-to-day contacts with the trade.

Good grade Beef should not be a "lower" grade. At present price levels, there just isn't the 5, 6 and 7 cents a pound difference in the value of a carcass of Good Beef over a carcass of Choice, as shown on the chart.

Some observers attribute this apparent discrimination against Good grade to the policy of some retailers not to handle anything below

Choice. Whether or not that is so, we cannot blame the retailers. They are engaged in a highly competitive business and have to operate their stores in accordance with their best judgment.

It is encouraging to note that the best judgment of some very successful retailers has been to handle two grades of Beef; at least during certain times of the year. Perhaps other retailers can be shown through merchandising research that they can improve their businesses by being more flexible in their Beef buying.

I haven't said anything about research techniques, and am not going to say very much. That is your field, not mine.

Hitherto, however, the research projects I have seen have mostly involved personal interviews. Therefore, they necessarily were confined to a small area. Maybe someone can find a way to get the information we seek without the detailed work involved in consumer interviews.

With this in mind, we looked over the survey data available to us for possible comparison with the survey of our Sales Managers' preferences, which I mentioned before. The only location we found where even a fairly good comparison was available was in Phoenix, Arizona.

The University of Arizona study was made in Phoenix in 1955, and the Manager of our Phoenix Branch House made his recommendation as to an ideal supply of Beef for his trade in 1954. Here are the comparative figures for what they are worth:

Grade	Consumer Survey First Choice %	Armour Manager %
Prime	--	5
Choice	32	40
Good	41	40
Commercial	27	10
Utility	--	5

Some of you may disagree, but I feel that those figures are quite close, considering everything involved. The Armour Manager, of course, has to get in a supply of Beef to fill the orders of hotels and restaurants, as well as retail stores. The restaurants will account for practically all of the Prime Beef and some of the Choice -- very little of the other grades.

Of course, the consumer survey and our Manager agree completely on the percentage of Good.

In a sense, our Manager at Phoenix made a fairly accurate forecast of the result of the consumer survey without knowing it. I would like to believe that all of our Managers could do as well, or be as lucky.

I have just one thought in closing. It seems to me that we have two major areas for improvement in the livestock and meat industry which can benefit through the type of research you are discussing today.

The first involves the very obvious job of grading, sorting, cutting and shipping the Beef that comes to market every week so that the supply available everywhere will be as close as possible to matching local requirements. Coupled with this, of course, are the possible methods we can develop to influence demand and flatten out the price peaks and valleys which are due to variations in livestock supply.

The other area for improvement involves the up-grading of our entire meat supply. We have seen that there is a ready demand for certain quantities of every grade and weight of Beef, and that this demand is only partly due to differences in price. The general pattern of demand probably is historical. While this pattern will probably persist for some time to come, there can be no doubt that there have been changes and there will be more changes.

As our standard of living has risen, people have up-graded their tastes. The movement of population from farms to city, and from one section of the country to another has also had an influence. There are a lot of fellows today who fancy themselves as connoisseurs of fine steaks and roasts who didn't know that there was anything better than old cow Beef until they were 21 years old.

We feel sure that the people who buy Beef in retail stores are becoming more discriminating. There has been a sharp increase in demand for Beef which comes from animals young enough to be tender and old enough so that the meat has a good Beefy flavor. The Beef desired should have an adequate covering of creamy white fat, but the external and internal fat cannot be excessive.

Beef carcasses answering this description will weigh 500 to 600 pounds, and will grade Choice. There are many times during the year when we have difficulty filling orders for Cattle of this type.

It would be very helpful if we had some reliable research data as to the proportion of consumers who want this young but well-finished Beef. Then we could go to the producers and feeders and get them to point toward supplying that demand.

With so much depending economically on the production and marketing of our meat supply, it is to be hoped that research can guide us in making plans to up-grade our meat supply in the years ahead.

You have been very patient in listening to me, and I thank you for your attention. I only wish we had more to offer in the way of concrete recommendations. I am sure we all feel confident, however, that we are moving toward a better understanding of our problems and methods of meeting them.

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DR. BRATZLER: Thank you, Mr. Klasing.

You folks think you have troubles but how would you like to be in the packers' shoes? You have to sell everything. Your stomach is just so big and you cannot eat it all if it does not sell.

We have heard from the packer's representative. Now we will move on to the retailer, and Mr. S. T. Shaw, who is Vice President of the Safeway Stores in charge of their Washington, D. C. branch, will speak to us.

I asked him what his background is or what phase of Safeway he is particularly interested in. He said that during World War II, when they had a packing plant, he was in livestock and meats. He has had sixteen years' experience with Safeway. Prior to going with Safeway he was a Commissioner of Agriculture and he was also a college professor at Brigham Young University, in the Beehive state. As soon as he had a chance he went over to Al Pearson. It seems as though the Utah boys can spot one another across the room. Mr. Shaw. (Applause)

MR. SETH T. SHAW: It certainly is good to see this number of people who are interested in and engaged in meats research.

One thought that struck me a while ago. I have been here all afternoon and I heard the discussions on bound water, the nature of proteins and how they are built and how they are broken down. We do pretty good on those $64,000 programs, but I some times wonder what would happen if they threw a really simple question at us and they asked some of those elementary questions that I want to deal with here today.

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MEANS OF STRENGTHENING CONSUMER PREFERENCE STUDIES

SETH T. SHAW

SAFEWAY STORES, INCORPORATED

I appreciate the opportunity of discussing with you today the subject assigned of how consumer preference studies on meat can be improved. I feel somewhat on the spot because several of you have heard me make critical remarks regarding some of your work. That is probably the reason I was asked to discuss this subject. I'm not sure what you had in mind - whether to put me in my place or to see whether I could possibly come up with some constructive criticism. The first objective, if such it could have been, was achieved. The longer I worked on the preparation of this paper, the more confused I became. I do hope that out of my confusion will come some thoughts which may be helpful to you in future studies.

It may help you in following my remarks, if I first state my premise -- It is that we do not have sufficient basic knowledge concerning meats to conduct meaningful studies of the type you are making. Your studies to date have shown that the consumer has little knowledge of beef grades, or of the characteristics of the meat which have been associated, right or wrong, with eating quality. It is my belief we must go further back to develop the kind of information needed to properly interpret the results of the studies you have under way.

The problem is extremely complex - yet, it seems relatively simple. We think of beef quality in terms of (1) tenderness, and (2) flavor. But, how much do we know of these factors? We know, for instance, that tenderness varies inversely with the age of the animal, but we do not know what this tenderness curve, in relation to age, looks like. It is my view that tenderness depends almost entirely on the age of the animal. I admit I am not familiar with all of your work, but so far as I know, this age factor in relation to tenderness has been overlooked.

I doubt that degree of fatness has much effect on tenderness. We have been led to believe that confining animals during fattening has had a tenderizing effect. However, I doubt that this view has been established by research. I remember that Michigan a number of years ago approached the problem by walking one, of paired steers, in a tread-mill while keeping the other confined. They found no difference in tenderness as related to the exercise. It has been reported by some research that marbling does confer some tenderness to the meat. More research is needed to clearly establish this relationship. On the other hand, tenderness is affected by aging of the meat. How much do we know about the tenderizing effect of aging? Very little work has been done on this subject. Our Safeway observations and tests, plus the research of USDA, would indicate that beef toughens during the first 72 hours after slaughtering. It then begins to tenderize slowly, reaching the accelerating phase of the typical "S" curve at about the fifth day. The accelerating phase runs from about the 5th to about the 13th day

when it again levels off. It continues to tenderize, but at a slower rate. (I should mention that this is at 34 degrees Fahrenheit.) It has been my contention that we lose much of the value of the additional finish in the higher grades if we do not age the meat. In other words, "Prime" and "Choice" may be initially less tender than "Standard" based on the age of the animals, but "Prime" and "Choice" may be tenderized by aging to a far greater degree than the "Standard." I personally would not expect any difference in tenderness from identical twin steers at the same age if one graded "Standard" and the other graded "Choice." The Choice carcass, however, could be aged for two or more weeks, while the other one could not. I am wondering if you have taken this aging factor sufficiently into account in your studies.

We also know there are inherent differences in tenderness between animals, but we do not know very much about the magnitude or range of this variation. Until we know more about the variation in tenderness between animals, we will not know the size of sample which could be expected to give reliable results.

Now let's talk about flavor. Degree of fatness surely affects flavor. Practically all customers want the retailer to trim off the fat, but then they ask for a piece of suet to cook with the roast. I believe we are also pretty safe in the assumption that degree of marbling affects flavor. Fat, inside the muscle, should affect flavor to a greater degree than outside fat. So far as flavor is affected by fatness, is there a point beyond which additional fattening has no affect? That is question that was before us re lamb grades. But, is fatness the only factor involved in flavor? No, the flavor of the meat changes with the age of the animal. Veal flavor certainly differs from fully mature beef. It is not a matter of which flavor is best. I only want to make the point that flavor does change with the age of the animal. This is very pronounced in the change from milk lamb to mature mutton.

What about cookery? It is possible that Home Economists have done much to establish the relationship of grade of beef to cookery. This aspect of the problem is indeed part of the whole problem, but I feel even less well qualified to criticize the work in this area. I do, however, want to raise a related point. We say that we harden-up cattle in the feed lot. Does this mean firmer flesh as well as firmer fat? If the lean is firmer, it probably contains less water, or in other words, it would have a higher dry weight per pound of fresh meat. Does firmer meat shrink less in cooking? Is the difference in dry weight of lean meat of any appreciable economic significance to the home maker? In other words, is it sufficient to warrant a price differential?

There is another grade factor we should probably consider. It is conformation. Conformation has to do with the shape of the carcass. It is related to the cut-out value of the carcass, but not necessarily to eating quality. In this instance, I am thinking of eating quality in terms of a given portion of lean muscle. I do believe, however, that conformation is related to consumer satisfaction, particularly so, in certain cuts. It is my view that the home maker wants a rib roast with a large eye muscle. The lean may not be any more tender or flavorful than from a small one, but there are other satisfactions to consider.

Then, we cannot overlook certain other factors of importance to the retailer. He wants to handle meat with a minimum of shrinkage. Soft watery meat shrinks much faster than meat from carcasses with a good cover of fat. The retailer also considers the appearance of the meat in his case. Light creamy white fat in contrast with bright cherry red lean presents a picture pleasing to the eye. Soft watery meat loses more tissue fluids, which makes for unsightly packages. It has been our experience that the higher grades of beef not only have better appearance, but will hold their appearance or bloom much longer than the lower grades. The advent of self service meat operations has had its affect in building demand for the higher grades for the reasons mentioned. I'm quite willing to admit, however, that if we could be sure of giving the customer greater satisfaction with a lower grade that we could adapt these operations to handle it successfully.

I believe I have said enough to return to my original premise -- that we do not have sufficient background knowledge to properly attack the problem at the consumer level. By the same token, I have the same criticism of federal grade standards. The federal beef grades themselves should be grounded upon demonstrable consumer preference. Otherwise, they are economically meaningless. It is my view that our work at this stage should be so framed as to convincingly demonstrate the consumer quality preferences which must be the basis for the federal grades. It occurs to me that you people should divide this complex problem into its many component parts. My recommendation is to transfer the prevalent types of non-integrated consumer preference studies for beef to their proper places as integrated steps in a comprehensive and organized analysis of beef grades. Such analysis would need to be broad in scope. It would necessarily require considerable time. The objective should be to identify and evaluate the physical characteristics of meat which are associated with consumer preference. We may then find it necessary to modify our grade standards in line with those findings. There should be careful preliminary planning. Uniform and consistent procedures should be used and spelled out in advance. Although some of many small scale studies might give inconclusive and non-significant results, the pooled consolidation of the results of all such studies should be quite significant and enlightening. The recent work of Rhodes & Kiehl shows some progress in this direction.

In conclusion, I am going to tell you why I think Safeway Stores should continue to standardize on U. S. Choice grade beef,

1. Only steers and heifers can qualify for this grade. Have sufficient maturity for beef flavor.

2. Choice grade carcasses in the 500 to 700 pound weight classification were either started on feed as calves or yearlings. The age of animals therefore will be quite uniform.

3. Only animals with good conformation will be fed to Choice grade. This means that most of the animals will be reasonably uniform in breeding from beef type cattle.

4. These carcasses have sufficient finish to take aging.

5. This degree of finish minimizes shrinkage and maximizes appearance and case life.

In a nutshell -- we want the greatest degree of uniformity, week in and week out, that we can find. The affect of (1) age of animal, (2) length of feeding period, and (3) aging of the meat should result in that kind of uniformity. Our customers have learned they can depend on our quality. They buy with confidence, which is so essential with self service meats.

But please do not misunderstand me. We don't pretend to have the answers to the questions I have raised with you today. It is only as answers to these questions are developed that meat grades will clearly reflect consumer preference. When they are so refined, we will be better able to develop methods of livestock management, processing and retailing to give the consumer more nearly the best possible combination of all of the desirable factors or characteristics in fresh meat.

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DR. BRATZLER: I think you will admit that the three speakers have done an excellent job and raised some pertinent questions in your minds. To bring them out we have with us W. Y. Varney, otherwise known as York, from the University of Kentucky. York, they are yours. (Applause)

MR. W. Y. VARNEY: I am sure that there are several points that would bear some discussion. So we will throw it open for discussion or questions from the group right now.

DR. SCHULTZ: First I want to say that I have heard Mr. Shaw before and I have always gotten a good deal out of listening to him because he brings up questions for which we do not have the answers. I hope that what he and Mr. Klasing have given us this afternoon stimulates everybody to try to get the answers.

I have about three other comments.

One is that there is a tendency, I believe, to misinterpret some of the consumer survey results. For instance, Mr. Klasing showed us results from the Arizona study indicating that 33 per cent of the people want choice, 41 per cent good, and 27 per cent commercial. Word has gotten around that the people in Arizona want good beef. Well, you cannot face these statistics and say that, because here are represented almost as many in the other two grades. So it seems to me that we will still have to supply these other grades. We cannot confine ourselves to one grade.

The second point is with regard to geographical differences. I was interested in Armour's study because, as I believe Mr. Klasing indicated, it indicated what people have been given to purchase. It does not necessarily mean that the people want exactly what is being sold to them in the stores. In order to get the answer, or to try to get the

answer to this geographical difference, we have well over 1,000 of these three dimensional pictures of these four different cuts.

Several people have written to us asking if they could use those pictures in surveys in their states, which definitely confronted us with the good opportunity of taking the same samples essentially to various regions of the country to see if people react the same in every area. The California group have already asked to use the pictures, and they are setting up a store survey in exactly the same manner -- I should not say in exactly the same manner but in almost exactly the same manner that we have done in Oregon -- and they are going to start to make it this summer.

Of these pictures we took three sets in the hope that people would borrow them and use them in the various areas. If any of you want to talk with me about it here during the conference I will be glad to talk with you. Otherwise, we are going to send letters offering it to the various stations in order to set up a cooperative project. It is relatively simple with the pictures. We don't ask a lot of questions. All we do is show the pictures and ask the person to indicate which of the two, assuming the price is the same, she would prefer to buy. There is no questionnaire to fill out or anything like that.

Also I think that selecting the samples properly in retail stores in various areas of the country and taking 3-D pictures and then assembling those pictures in one location and evaluating them will give us the answer as to what is being sold in various parts of the country.

I don't know any way to do it with fresh samples.

MR. VARNEY: Thank you for those interesting observations.

Are there others?

DR. DEATHERAGE: I was particularly interested in the last speaker's comments on physiological age. I think more important is a mission we could all perform; that is, I think often times the meat programs in institutions have been -- well, stepchildren, and it is extremely difficult to talk nutritionists into backtracking and giving you animals of known physiological age. The nutritionist says, "I know all there is about feeding animals out to get quick gains," and that is that.

I recall the experience that we had about eight years ago when the Hereford group was setting up a test at three stations, which would have permitted unequivocal evaluation of this. We tried our best to get hold of them. They refused to give title.

So we have a selling job among our own people to try to convince them that there is something more to meat research than feeding out animals or to putting lard on them.

Now that we have O. D. Butler in the driver's seat maybe we can get some of the nutrition boys to backtrack and give us some animals which we know a little more about.

MR. VARNEY: I think we will all agree that we have a problem there.

We are to have a comment from Mr. Rust.

MR. RUST: This morning I cited the incident that happened to one of the national food processors that would leave some doubt, at least in my mind, as to the validity of the consumer's statement as to her preferences compared with what she will actually purchase. Maybe someone would like to answer this question, maybe not, but I wonder why more studies haven't been set up to survey the consumer's preference by actually determining what she will pick from the meat case and take to the checkout counter and pay for because there I think is the final answer to that question.

Furthermore, I wonder, too, if anyone has ever attempted to correlate the consumer's past experience and the availability of certain grades of meat in an area with what her preferences or likes and dislikes are. I think here also is an area that needs some exploration.

This would admittedly be difficult to do, but I personally would like to see some research, some measurements of the effect of attempts to change the consumer's supposed preference and to influence what she will purchase. I think this actually comes in the field of sales promotion. In other words, would education or promotion or whatever you want to call it along a certain line have more effect on what the consumer purchases in the line of meat than some of the preferences she has built up from what she has heard and learned, and so on?

MR. VARNEY: In other words, you are saying in essence that the consumer does not always tell you the exact thing she will buy, and she says that she will buy one thing but in actuality she buys another.

MR. RUST: I am inclined to believe that is true. I am inclined to believe that she is not quite sure what she wants and that her taste isn't developed. I think that what happened either to Heintz or Campbell after they made an extensive survey of consumers is a good example. It is a kind of humorous incident, but it means quite a few dollars and cents to them.

DR. VARNEY: One question comes to my mind now that Lyman brought up in the correspondence during the formation of this program. That is, repeat sales. It could be a threat to the industry. What I mean by this is that we could be inviting competition from other circles. Lyman, you know what I am talking about. It is consumer surveys indicating that consumers will buy, or desire to buy, lower grades of beef. Would you like to comment on this point?

DR. BRATZLER: I am a little concerned about the repeat business. Someone mentioned over here that we have tenderness problems with pork. At Michigan one of the graduate students is vitally interested in how lean is too lean in pork. I am sure the consumer will come in and buy a nice red, lean piece of meat and take it home and cook it and eat

it, but maybe it will be ten days before she will come back and buy another steak rather than four days. I think that is of primary importance and concern to us.

MR. VARNEY: We have another comment right here.

MR. ROBERT E. BRANSON (Texas A. and M. College): First I should like to address my comment and question to the question raised in the back of the room about whether the consumers will buy what they indicate they will buy on consumer surveys. I would be the last person, I think, to say that you cannot go out and do a bum consumer research job just like you can do a bum research job on anything else. However, through a rather limited store test in Houston, following up our consumer purchase survey, we have found that there is a rather close correlation between what the consumers say they will buy and what they do buy. The test was conducted in a store that was in an average to high income area. The steaks that were available for them to buy were good, commercial and choice. They actually bought more commercial and good than they said they would in the survey. This indicates that if there is any bias it is that they are more inclined to say that they are going to buy something better than they actually do buy in the store. These were all priced the same.

I think if it is properly done you can transfer information from the consumer surveys to what they actually do. Some buyers have misinformed, it is true. But if you want to take another product, take powdered milk. One of the best merchandising jobs done on powdered milk was preceded by a consumer survey asking the consumers what they wanted and the results proved to be very satisfactory. They designed their whole production process and containers around it and they had tremendous success with their sales operation.

The second thing I should like to say is that I also believe we need to have a better clearing house for information on what consumer research is being done in various areas. I noticed that Texas was listed, for example, as doing work in beef. We made a market test with Swift and Company, in Waco, Texas, on frozen beef, which was the first city-wide test. It proved primarily that all they can say is that they can sell the veal cutlets and that type of thing, I was talking with them on the telephone today, and that has been pretty much their experience with the exception of in the northeast where people are used to buying deboned beef. One of the big problems in trying to sell frozen beef is the fact that it is deboned. It is about 3 per cent, but ask housewives and they will tell you that it is 10 or 15 per cent. We cannot expect them to make this conversion if they cannot make any better estimates than that.

We are also working on chicken and lamb and pork. So that we are doing quite a bit of work.

We are interested in knowing what anybody else is doing.

In fact, we have about 10 consumer research projects under way at the present time, and we have organized a unit in the Department of

Agricultural Economics for the purpose of handling this type of work. So we are very interested in what is being done and we would like to cooperate with anyone.

I think that one reason people get misled in consumer market research is because a lot of times they don't stop to consider the differences in the methods used. You noticed that the consumers' surveys that were pointed out here, the one in Phoenix, the one in Houston, and the one in Denver, and a number of others, indicated that good grade seems to be preferred more than the choice grade. Then we have the report that was distributed to us giving the ratings on tenderness, juiciness and flavor and which says that choice is the best. I am sure that this is excellent research and I have no reason to question it. However, it leaves out the problem of fat. It is not what the individual is buying in the store. If we would put on there the amount of fat that is going to appear on the steak, we might find them coming back and buying the good.

We have used this type of system at A. and M. Dr. Butler and Dr. King have worked with it and came out with very similar results. What I should like to call attention to is not the fact that the choice is higher than the commercial but the fact that they are so close together. You have a difference of only 6 to 7, and I am not sure that the consumer would really pay much attention to the difference between 6 and 7, if one had a half inch of fat on the outside and the other did not.

So these are some of the things that I think we need to look at very closely in evaluating our consumer research and to be sure that we are using consistent methods.

MR. VARNEY: Thank you.

I am sure that many more interesting observations could be made but the hour is getting late and we are requested by the Chairman to stop at this point. So I should like to turn it back to Lyman.

DR. BRATZLER: Thanks very much, York.

I should like to express my thanks to the entire committee for its labors, and particularly to York and Gene. Maybe you have some idea of all the work that is being done in Texas now.

Back to you, Tom.

CHAIRMAN BLUMER: Thank you, Lyman. I think from the discussion you can see that you created a lot of interest among the group and we could keep on going.

Mr. Klasing and Mr. Shaw, we certainly appreciate your taking time to come over here and meet with us.

(Announcement)

CHAIRMAN BLUMER: In the morning please be here at eight o'clock and we will try to get under way promptly.

(The meeting recessed at 5:30 o'clock.)

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TUESDAY MORNING SESSION

JUNE 11, 1957

The meeting convened at 8:00 o'clock, Chairman Blumer presiding.

CHAIRMAN BLUMER: The conference will please come to order. We will start with the Beef Carcass Evaluation Committee's report. The Chairman is O. D. Butler.

DR. BUTLER: We will start right in with our papers this morning because we want to run the program on schedule.

One of the most controversial issues in the beef business today we think is the effect of diethylstilbestrol feeding on beef quality. It is pretty well accepted that we can get increased gains with the use of stilbestrol, but whether it is really beneficial or not to the industry is still a matter of concern.

Charley Adams has done an excellent job of reviewing the literature, and I am sure that he will have some information that will shed some light on this subject. Charley Adams. (Applause)

MR. ADAMS: Thank you, O. D.

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THE EFFECT OF DIETHYLSTILBESTROL ON BEEF QUALITY

CHARLES H. ADAMS
UNIVERSITY OF NEBRASKA

At the Seventh Annual Reciprocal Meat Conference Joseph Kastelic (1954) presented a paper dealing with the influence of hormone administration and the production of beef. He stated at that time there was a dearth of data about the effects of diethylstilbestrol on carcass quality. Since that time many of the experiment stations have conducted projects related to the subject of implanting or feeding diethylstilbestrol to almost all classes and weights of cattle.

The next year at the Eighth Annual Reciprocal Meat Conference, Robert L. Reddish (1955) presented a paper on new developments of the effects of hormones on fattening cattle. In his paper he discussed the following topics: dosage, gains, increased efficiency, length of feeding periods, effects on the live animals and the effects on the beef carcasses.

The purpose of this paper is to bring us somewhat up to date on the subject of the effect of diethylstilbestrol on beef quality. Even though a list of literature cited is presented it does not cover completely all experiments dealing with this subject. Many other experiments have been conducted using diethylstilbestrol but in many cases no reference is made to the end product, the beef carcass. It may be stated that the literature cited covers material from forty-five tests at sixteen stations where over 900 cattle were fed diethylstilbestrol and twenty-seven tests at seven stations where over 850 cattle were implanted with diethylstilbestrol.

Klosterman (1955) at the Cornell Nutrition Conference for Feed Manufacturers stated that diethylstilbestrol made no significant difference in yields, tended to lower steer carcass grades and increase bull carcass grades, with considerable variation in grade among carcasses within treatments, tended to increase rib-eye area in steers and reduce it in bulls, tended to increase edible portion of steers and reduce it in bulls and from the limited data available diethylstilbestrol implanting made a slight reduction in tenderness. He also stated that effects of diethylstilbestrol on beef carcass quality are relatively small as compared to age of animal when slaughtered, ration fed, length of feeding period and carcass ageing.

A significant increase in lean and area of the rib-eye from implanted steers was reported by Clegg et. al. (1954)(1956), and Simon et. al. (1955). They also reported a significant decrease in fat content of the carcass. A significant increase in per cent moisture of implanted spayed heifers and intact heifers as well as a significant decrease in ether extract and a significant increase in the area of the rib-eye was also reported. They found no difference of organoleptic quality between treated and untreated cattle carcasses.

Slight increases in rib-eye area (but the same size when placed on a carcass weight basis), less fat over the rib-eye while the percentage of liver, viscera and hide were reported by Parsons (1956) as being the same when cattle were fed diethylstilbestrol. No significant carcass differences were reported by Deans et. al. (1955)(1956), from studies made of separable fat, lean and bone, ether extract from the rib-eye, cooking shrinkage or shear test. An increase in per cent moisture in the fat and increased ether extract of the rib-eye approached significance for the treated animals.

Aunan et. al.(1956) reported that diethylstilbestrol treated steers had larger rib-eyes but had the same percentage of moisture in the rib-eye. They also reported that steers fed diethylstilbestrol 112 days graded higher than the controls but when the controls were fed to the same weight they graded higher than the carcasses from the treated steers.

At the North Platte Nebraska Experiment Station, Baker et. al. (1956) reported an increased area of the rib-eye for treated steers but when the area was based on square inches per one-hundred pounds of carcass there was no difference. They also reported no differences in grades for treated and untreated cattle.

Carcass studies made by Cahill et. al, (1956) revealed diethylstilbestrol implanting gave a significant increase in weights of steer chucks, significant decrease in steer flanks and kidney knobs yet gave a significant decrease in weights of bull chucks and area of the rib-eye and a significant increase in the weight of bull flanks. They also reported heavier pituitary and adrenal glands for the treated animals and lighter thyroid glands from bulls but no change in the thyroid glands between treated and untreated steers. Implanting diethylstilbestrol reduced the carcass grades for steers and increased the bull grades. At the same time treated bull carcasses were fatter while treated steer carcasses were leaner which in turn increased the edible portion of steers and decreased the edible portion of bulls.

Beeson et. al. (1956) reported a significant increase in percentage of moisture and a highly significant increase in percentage of protein in the lean meat of yearling steers fed diethylstilbestrol while Andrews et. al. (1956) found no difference for these carcass characteristics in steer calves fed diethylstilbestrol.

According to Good et. al. (1957) steers fed or implanted with diethylstilbestrol had no significant effect on yield, shrink to market, carcass grade, cooler shrink, moisture content of fat or lean, cooking quality or measurements of the right metacarpus. Feeding diethylstilbestrol significantly increased the per cent of lean and decreased the per cent of fat in the carcass. Implanting increased the per cent nitrogen content of the rib-eye muscle. Diethylstilbestrol also significantly increased the width of the round.

A report on four investigations using ninety-two cattle by Kastelic et. al. (1956) revealed that diethylstilbestrol has no consistent influence on carcass characteristics as measured by carcass weight; grade; per cent fat, bone and lean of the 9-10-11th rib; area of the rib-eye and thickness of fat. They state that differences in carcasses are probably not due to nutritional treatment but are due to inherent biological differences among the animals on test.

It may be noted at this point that daily gains for cattle fed diethylstilbestrol were greater in all tests reported than the controls. Implanting with diethylstilbestrol also increased the daily gains in all tests reported except for Smith et. al. (1957) who reported that heifers implanted with 36 mg. gained at a lower rate than the controls. They also reported no significant carcass differences between spayed or non-spayed heifers.

Carcass data on grades and yields were reported by Andrews et. al. (1954) (1956), Aunan et. al. (1956), Baird et. al (1957), Baker, F. S. et. al. (1955), (1956), Baker, G. N., et. al. (1956), Beeson et. al. (1956), Bell et. al. (1955), Burroughs et. al. (1954) (1955), Cahill et. al. (1956), Clegg et. al. (1954) (1956), Connell et. al. (1955), Deans et. al. (1955) (1956), Dowe et. al. (1957), Duitsman (1957), Good et. al. (1957), Hentges et. al. (1955), Kastelic et. al. (1955) (1956), Klosterman et. al. (1955),Koch et. al. (1957), Luther et. al. (1955), Marion et. al. (1955), Matsushima et. al. (1956) (1957), Mitchell et. al. (1955), Murphee et. al. (1955), O'Mary et. al. (1956), Parsons (1956), Perry et. al. (1955), Pope (1956), Richard et. al. (1956), Richardson et. al. (1957), Simone et. al. (1955), Smith et. al (1957) and Story (1956) (1957). In 27% of these tests where cattle were fed diethylstilbestrol the yields were greater, 47% of the tests lower and 24% of the tests about the same. For grades the diethylstilbestrol fed cattle produced higher grading carcasses in 31% of the tests, lower grades in 33% of the tests and about the same grade in 36% of the tests. Cattle implanted with diethylstilbestrol gave higher yields in 26% of the tests, lower yields in 61% of the tests and about the same yields in 13% of the tests. For grades the carcasses from diethylstilbestrol implanted cattle graded higher 33% of the time and lower 67% of the time. The amount of diethylstilbestrol fed or implanted seemed to make but very little difference.

As a summary for this review of carcass data I would like to quote from Kastelic et. al. (1955). "The current studies revealed that there exists among cattle larger variations in degree of muscling and amount of fat regardless of ration treatments and that it was not possible to relate these differences to levels of stilbestrol fed".

Stob et. al. (1956) reported that tissues from the liver, kidney, kidney fat and muscle at the 11th and 12th rib of cattle fed diethylstilbestrol when fed to mice gave a statistically significant increase in uterine weights of the mice. In contrast Preston et. al. (1956) examined tissue (lean, fat, liver, kidney, heart and offal) removed from cattle fed diethylstilbestrol in four experiments which revealed no detectable estrogenic residues. Either of the two methods of assay would have shown the presence of as little as 2 micrograms of diethylstilbestrol per kilogram of tissue. Turner (1956) also reported that tissue from steers fed diethylstilbestrol was free of residual estrogen. The tissue tested was edible red meat, rib-eye, neck trimmings, tongue, heart, spleen and brain. The kidneys contained 4 parts per million and the lungs 10-12 parts per million of residual estrogen.

The data available at the present time presents considerable conflicting effects on carcasses from feeding or implanting diethylstilbestrol. Diethylstilbestrol gives consistent daily gain increases but probably has little effect on carcass quality provided the treated and controls receive the same total amount of concentrates. There may also be a question in the

minds of some people regarding the residual estrogens which may be present in meat from cattle treated with diethylstilbestrol.

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DR. BUTLER: This committee is attempting to adhere to the original concept of the reciprocal meat conference, which is to allow some discussion following the papers. For me that is one of the reasons for us to get together here. So I should like for Harold Hedrick to come up now and conduct the discussion.

DR. H. B. HEDRICK: I wish to thank you, Charley, for your excellent review. I am sure that everyone appreciates the time and effort that you have put into this.

Those of you who are doing carcass work on cattle, either implanted or diethylstilbestrol, should have no trouble finding literature to support almost any results you might find.

At this time are there questions that you would like to direct to Charley or comments that you would like to make?

MR. VARNEY: I should like to call attention to the reference at the top of page 4. I think that we should give credit to conference members when it is due. The name of Jim Kemp has been inadvertently omitted from this report.

MR. HEDRICK: Are there other comments or questions?

MR. KEAN: I wonder if anybody else is getting the response that we seem to be getting from some of the companies in the East about fat setting up on diethylstilbestrol-fed cattle. Has anybody else experienced this? Some of our packers are starting to complain, not vigorously but quite often about it, that they cannot get the fat to set up with the lean nearly as firm as they would like to have it. I just wonder if this complaint has been made to others.

MR. HEDRICK: Is that due to the lower grade?

MR. KEAN: I don't know. They complain about all of them.

MR. HEDRICK: I should like to raise a question. You made reference here to Klosterman's work in which the feeding of diethylstilbestrol reduced the tenderness. Since we have an expert group on tenderness maybe we can have some comments on that.

DR. DEATHERAGE: I suppose you are asking me because that was done in our laboratory. (Laughter) I don't have the record. However, it was significant. From the standpoint of investigations whether it would be of practical significance is another matter. Certainly from all the work that we did, with all of the steers lumped together we would have to say they were less tender, and in the case of the bulls I would say probably just about as much.

I think Vern or Larry will have some comments on that.

MR. SOULE: I have one statement that I should like to make. You get the reports from the experiment stations on feeder days, etc., and they say that the feeding or the implanting of stilbestrol (and other things come up, too) lowers the carcass up to a third of a grade. They will put numbers on there, some going from 1 to 12 and some going from 12 down to 1. The first thing you have to do is to convert all of them. You have to write the guy and find out what he means. Is he going up the scale or down the scale when he gives the grade? That is something that should be standardized.

Anyhow they come in and they say there is a lowering of the grade, you see. Davie knows and he does it when he follows the carcasses in Kansas City or St. Joseph. You have those little cards on there that give you the marbling. You can have the grader give you the marbling scores just like he gives the texture scores. For just a simple little thing like that why don't you get after your nutritionists? I know it isn't your fault but get after your nutritionist so you can have more information.

That is what I am fighting for with some of the fellows in our company when they fail to get all that information. I have it all written up so that they can go to the grader and get the scores on marbling and texture, and if they want to they can even go through and score the eye and the loin. I realize that it is only eyeball grading, but in many cases the carcasses are not even broken down. It seems to me that you should have more information than just saying there is a lowering of the carcass grade. It does not help us scientifically unless we know why. Of course, those records do not mean anything to the farmers, but if you could give marbling scores, firmness scores and texture scores it certainly would help a lot and then a person with a little deductive reasoning could figure out why there is a lowering of carcass grade.

That is not a question that I am bringing up. It is just a statement of fact that I am making.

MR. FRED CARROLL (University of California): Maybe I am going over something that has already been gone over because I missed part of this, but we have been running carcass compositions along with our testing of stilbestrol treated meat, trying to find out why the carcass graded lower. We finish these cattle out. Of course, they will not finish at the same time that non-treated cattle will, but if you finish them out then the difference becomes much less, and in three years of work the panels could detect the hormone-treated cattle, but it was not significant.

I mean, it would take a lot more numbers than we have done to show that there is a significant difference in eating quality between the hormone-fed and those not hormone-fed. But generally speaking, I think all the hormone does is your animals, if they are fed equally, are not quite as fat.

MR. HEDRICK: The Chair says that we have used up our ten minutes. So we will wait until the recess and then direct our questions to Charley.

Thank you.

DR. BUTLER: Thank you, Harold.

You will notice that we started with the second paper this morning. The reason was that some of the red hot data that Ohio put into the projector yesterday burned up the motor. But we have had it repaired and I believe we are ready to go now. So we will ask Johnny Pierce to give his report on some beef grading considerations. (Applause)

MR. J. C. PIERCE: This is a re-run of a paper that we gave at Chicago last December with a few minor revisions, and O. D. asked me to take a little more time and to get into it here today so that you people can tear into me. There was not too much time in December.

First of all, I should like to say that we have three people here from our staff, Charley Murphey, Lowell Strong, and I think Mr. Van Zant who has joined the Quartermaster Food and Container Institute, but I hope he is here, who has done more with certain phases of this work than I have. So if there are any perplexing questions we will just give them to them.

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THE INFLUENCE OF CONFORMATION, FINISH, AND CARCASS WEIGHT ON THE PERCENTAGE YIELD OF WHOLESALE AND RETAIL CUTS OF BEEF

By

J. C. PIERCE

UNITED STATES DEPARTMENT OF AGRICULTURE

This discussion covers a portion of a study initiated by the Department in 1950 to determine the relationship of certain carcass characteristics of beef, veal, calf, lamb, and mutton to the yields of wholesale and retail cuts. Some of the observations available from the beef data are presented. Our objectives were, primarily, to determine the influence of variations in conformation and finish upon yields of cuts, and to develop objective measures for these factors which could be incorporated into grade standards.

A total of 459 beef carcasses comprised the sample in this study. They were selected to include all grades from Prime through Canner and represent normal weight ranges for each grade. Table 1 indicates the distribution of carcasses by weight and grade. Grade was determined in the usual manner by a subjective evaluation of characteristics.

Since we were concerned with the effects of variation in conformation and finish, carcasses within each grade were selected to represent three ranges in each of these variables--superior, average, or inferior conformation, and high, average, or low finish. In order to qualify for selection for superior or inferior conformation or high or low finish, a carcass was required to have conformation or finish representative of a different grade than the quality grade of the carcass. For example, superior conformation for a Good grade carcass meant conformation of low Choice or better.

Carcass measurements were taken substantially in accordance with the procedure outlined and adopted by the Reciprocal Meat Conference in 1952. The following measurement data were recorded: (1) Length of body, (2) length of hind leg, (3) circumference of round, (4) depth of body, (5) length of loin, (6) width of shoulder, (7) thickness of round, (8) length and width of eye muscle of the ribbed carcass, and (9) thickness of fat over the rib eye.

The cutting, trimming, and weighing procedures were too detailed for a full report in this paper. A major objective of the cutting procedure was to establish yields typifying four general stages of cutting and trimming: (1) Regular wholesale cuts, (2) retail cuts without removal of any surface fat, (3) intermediate trimmed retail cuts rather typical of general practice, with surface fat in excess of one-half inch removed, and (4) close trimmed retail cuts including some partially boneless or boneless cuts, short loin steaks with all flank portion removed, and similar refinements in other cuts.

Each carcass was individually cut and hand trimmed by the same butcher, weights of all cuts and trimmings at each step were recorded to the

nearest ounce, and all yields were computed as a percent of carcass weight. Thus considerable detail and volume of yield data were secured. We will concern ourselves with only a few of the yields in this report.

The statistical analyses of the beef data were carried out under contract with North Carolina State College, Raleigh, North Carolina, and were limited primarily to simple and multiple regressions and correlations to establish the relationships of objective measures, grades, and yields of cuts. The observations include eleven objective measures of conformation and finish; side weight; and the conformation, finish, and final grade of the carcass. The following yields were considered: (1) All wholesale cuts, (2) the major intermediate trimmed retail cuts from the round, loin end, short loin, chuck, and rib, (3) the close trimmed retail cuts for these five cuts, and (4) the sum of these 5 cuts at the wholesale and the intermediate and close trimmed retail levels.

Table 2 indicates the variations in yields of beef cuts in the study. The range from the high to the low mean yield for weight-grade groups is shown as a percent of the mean yield for all carcasses. For example, in the case of wholesale round yields averaging 24.4 per cent for all carcasses, one weight-grade group averaged 22.0 percent and another 28.2 percent. This range of 6.2 percent represents 25 percent of the mean yield for all carcasses. Obviously, this method minimizes the variation, for it does not include that variation of individuals from the weight-grade group means. For example, the range in individual yields of wholesale round was approximately twice as great as the range among the means for weight-grade groups. Some cuts were relatively more variable in yields than others, and the five major wholesale cuts ranked in the following order, from most variable to least variable: Short loin, loin end, round, rib, and chuck.

Analysis of variance indicated that grouping according to weight and grade would remove about 45 percent or more of the variance in yields for 17 of the 22 wholesale and retail cuts studied. The reduction ranged from 62 to 71 percent for 5 of these 17 cuts. However, there is a considerable range in yields even within weight and grade groups. Table 3 illustrates some of the variability that was observed between individual carcasses of the same weight and grade. A range of 5.18 percent in yield of wholesale round and 7.27 percent in retail yield of the five major cuts indicates that there is ample opportunity for selection of breeding stock for yield of major cuts. It also illustrates the misconceptions that may result from observing only mean yields for groups. This further points out the need for developing an objective index that can be used to identify these carcasses with unusual yields.

Correlations between some objective measures and the conformation, finish, and final grades are shown in Table 4. The relationships are quite similar for all three grade measures, although they tend to be slightly higher with conformation grade than with final or finish grade. The measurements for which relationships are shown explain from 20 to 68 percent of the variation in grades. Width of round, round index, and eye measurements were less closely related to grades. Higher grade carcasses were shorter, thicker, and fatter and had less depth than lower grade carcasses. Within the grade-weight classes, depth of fat was the only measurement showing substantial correlation with finish grade, explaining 33 percent of the variation. Round circumference

explained about 40 percent of the variation in conformation grade within grade-weight classes; length of loin, width of shoulder, and width of round explained 19 to 23 percent.

A comparison of the accuracy of the objective and subjective measures for predicting cutting yields is of interest. Finish grade was more closely related to most yields of cuts than was depth of fat. In partial correlations adjusted for weight and finish grade, depth of fat accounted for less than 5 percent of the remaining variance in yields of cuts. However, in the reverse situation after adjusting for depth of fat and weight, finish grade accounted for from 5 to 40 percent of the remaining variance in all but 3 wholesale and retail cut yields.

No single objective measure of conformation was consistently better than conformation grade for predicting yields. Although some objective measures were better for a few individual yields, none were more closely related than conformation grade to more than one or two yields.

Some differences were noted with respect to accuracy of prediction between yields of wholesale and retail cuts. Retail yields of round and loin end generally could be more accurately predicted than could their wholesale counterparts. There was little difference in this respect for chuck yields. However, the notable feature of this comparison was the very low predictabilities for retail short loin and rib yields as compared with their corresponding wholesale yields.

Twelve combinations of measures were examined from the standpoint of value for predicting yields of wholesale and retail cuts. One series of 6 combinations included depth of fat over the rib eye as the measure of fatness and another series of six included finish grade. Table 5 shows the value of some combinations for predicting yields of wholesale cuts. Consideration of weight improved the prediction value of finish grade for most wholesale cuts, and for some cuts this combination was essentially as good as any involving more measures. More accurate predictions were also noted when weight was included with depth of fat, but predictions of yields of practically all cuts were further improved by considering additional measures. The best combination of purely objective measures gave near maximum predictions only for yields of loin end and rib. For each cut, the best combination of the 12 studied included the subjective finish grade with either (1) weight and conformation grade or (2) weight, length of loin, and circumference of round. Length of loin added accuracy to predictions of loin end and short loin yields, and circumference of round added accuracy to round yield predictions. However, conformation grade improved predictions of yields of most other wholesale cuts as much as or more than any objective measure of conformation.

Indication of the value of some combinations for predicting yields of retail cuts is given in Table 6. The pattern of predictabilities of retail yields was similar to that for wholesale yields. The reduced accuracy of predictions of yields of short loin and rib is apparent. The best purely objective combination included circumference of round rather than width of eye. The best predictions of yields were provided by the same two combinations as in the case of wholesale cuts--weight and finish grade with either conformation grade or loin length and round circumference. Another point of interest was that the sum of the yields of the five major cuts was more accurately

predicted than was the yield or any individual cut by all measures except the best objective combination.

Regression coefficients showing the effects of several factors on yields of wholesale cuts appear in Table 7. Higher finish grade and greater depth of fat were associated with higher wholesale yields of short loin, rib, flank, brisket, plate, and hindquarter, but with lower yields of round, loin end, chuck, and foreshank. Higher conformation grade indicated more round, short loin, rib, brisket, and foreshank, but less loin end, chuck, flank, plate, and hindquarter. Greater circumference of round was associated with higher yields of all wholesale cuts except hindquarter, loin end, flank, and plate. Heavier carcasses had more chuck, rib, flank, brisket, and plate than lighter carcasses, but lower yields of other cuts. Table 8 includes repression coefficients showing the effects of several factors on yields of close trimmed retail cuts. The effects of weight and round circumference on yields of retail cuts were in the same direction and approximately the same magnitude as the effects on wholesale cuts. The rate of change in short loin and rib yields associated with changes in depth of fat or finish grade was actually lower in retail than in wholesale cuts. As would be expected, higher finish grade was associated with a reduced yield of close trimmed short loin. The effects of depth of fat and finish grade on round yields were less at retail than at wholesale, but a similar comparison shows a greater rate of change in retail loin end, chuck, and sum of five cuts yields. The rate of change in retail yields of round, loin end, short loin, and rib associated with changes in conformation grade were slightly less than their wholesale counterparts. Higher conformation grade indicated lower wholesale chuck yields and higher retail chuck yields, but the coefficients were not significant.

Now let us consider the magnitude of these regression coefficients from the standpoint of carcass evaluation. First of all, the relative influence of conformation and finish should be noted. Finish influences the yield of most cuts, both wholesale and retail, considerably more than does conformation. The relative effect depends on the cut selected. Our grouping of the five cuts is arbitrary and was chosen because of the relative importance of these cuts. Since superior conformation and high finish have opposite effects on yields, the net difference in yield of the five wholesale cuts from one grade to another might be calculated to be slightly less than 1 percent, and slightly more than 1 percent on a retail basis. This is a relatively small difference. However, in carcass evaluation, each carcass must be considered individually and all carcasses are not uniformly developed in these two factors--conformation and finish. For example, consider two carcasses with the final grade of Choice--one with Prime conformation but only Good grade finish, and the other with Good grade conformation and Prime finish; the net difference in yield of the five wholesale cuts is approximately 3 percent, and nearly 4 percent for retail cuts. This 3 to 4 percent difference means 18 to 24 pounds on a 600 pound carcass, which illustrates the possible importance of conformation and finish from the standpoint of individual carcass evaluation.

The practical application of information obtained from this study in evaluating and improving grade standards merits and is receiving serious consideration. One of our goals is the identification of specific yield of

major cuts as a part of grade. Incorporation of this additional factor into the present standards presents complex problems, since yield and quality are not entirely compatible. A logical solution would appear to be the development of a system of dual identification in grading, with one symbol denoting quality and another indicating expected yield of cuts. For example, Choice might continue to be a quality term, but an additional designation, such as a digit, would indicate a specific range of expected yield of retail cuts. Such a system would be of primary importance to retailers and consequently to packers and producers. Consumers would not be particularly concerned with the yield identity except as it was associated with differences in ratio of meat to bone.

The use of objective measures closely related to yields obviously would facilitate the application of a grading system which included identification of yields. Unfortunately, these data indicate that subjective evaluations generally were superior to the objective measurements studied for predicting yields. While this does not preclude the possibility that other measurements may be more closely related to yields, it suggests that such relationships may be quite complex.

In comparison with pork carcass data, a relatively low proportion of the variation in yields of beef cuts was explained by any combination of measurements of conformation and finish. The best single combination for predicting yield of the five cuts accounted for 61.5 percent of the variance in yield of wholesale cuts and 70.9 percent in yield of retail cuts. While these indicate substantial correlations, similar studies have shown that a simple combination of back fat thickness and weight explains 70 to 80 percent of the variability in yield of lean cuts in pork carcasses.

Reflection on the results obtained in analyses of these data indicates other promising areas for research. The relationships of conformation and yields might be altered in a study involving boneless yields for more accurate approximation of the muscle-bone ratio. Depth of fat measurements at several locations on the carcass would be expected to minimize the effect of differences in distribution of fat deposition. It is recognized that the available data undoubtedly can provide additional information on the nature of relationships in beef carcasses and their practical application in carcass grading. Some of the relationships appear to be non-linear, and analyses on that basis may lead to different conclusions. Additional combinations of measurements and alternate combinations of yields appear to merit investigation. It appears evident that the range of variability in yield of cuts is sufficient to provide a fertile field for the animal breeder to exercise selection and to stimulate those in the field of meat research to develop a more precise method for identifying carcasses with unusual yields of retail cuts.

TABLE 1.--SAMPLING DISTRIBUTION OF SIDES OF BEEF

Carcass grade	Carcass weight, lbs.				
	200-300	300-400	500-600	700-800	900-1000
	(No. of carcasses)				
Prime			27	26	27
Choice		24	27	26	27
Good		22	29	24	
Commercial		19	28	27	
Utility	17	18	19		
Cutter		18	18		
Canner	19	17			

TABLE 2.--VARIATION IN YIELDS OF MAJOR BEEF CUTS 1/

Cut	Level of trim		
	Wholesale	Intermediate retail	Close trim retail
Round	25%	25%	24%
Loin end	22%	30%	2/
Short loin	33%	16%	18%
Square chuck	13%	14%	16%
Rib	22%	16%	20%
Sum of Five	10%	15%	16%

1/ Range among average yields for grade-weight groups expressed as percent of the mean yield for all carcasses.
2/ Close trim and intermediate trim identical.

TABLE 3.--VARIATIONS IN YIELDS BETWEEN CARCASSES OF THE SAME WEIGHT AND GRADE

Cut	Carcass 1		Carcass 2	
	Wholesale	Retail	Wholesale	Retail
	% of carcass		% of carcass	
Round	27.17	18.31	21.99	14.73
Loin end	9.30	8.88	9.88	8.69
Short loin	7.56	5.41	9.05	4.75
Chuck	25.41	21.52	22.32	18.81
Rib	9.02	6.77	9.50	6.64
Sum of five	78.46	60.89	72.74	53.62

Both carcasses Choice grade, 5-600 pounds

TABLE 4.--PARTIAL CORRELATION COEFFICIENTS, INDEPENDENT OF WEIGHT, BETWEEN CERTAIN OBJECTIVE MEASURES AND SUBJECTIVE GRADE DETERMINATIONS

Objective Measure	Subjective grade		
	Final Grade	Conformation Grade	Finish Grade
Length of loin	-.807	-.825	-.742
Length of body	-.691	-.714	-.649
Depth of body	-.695	-.690	-.666
Thickness of shoulder	.650	.729	.579
Circumference of round	.548	.740	.454
Depth of fat	.563	.492	.680

TABLE 5.--PERCENT VARIANCE IN YIELDS OF CERTAIN WHOLESALE CUTS EXPLAINED BY VARIOUS COMBINATIONS OF MEASURES

Combination	Wholesale cut					
	Round	Loin end	Short loin	Square chuck	Rib	Sum of five
Weight and Depth of fat	55.0	32.4	41.8	31.1	48.2	43.4
Weight, Depth of fat, Width of eye, and Length of loin 1/	57.4	56.2	58.0	41.8	57.4	47.3
Weight and Finish grade	62.4	47.4	64.7	50.5	56.4	57.0
Weight, Finish grade and Conformation grade	66.4	55.3	65.8	50.5	57.5	58.5
Best combination 2/	71.2	57.7	65.8	50.8	57.5	61.5

1/ Generally best combination of purely objective measures.
2/ Best combination among the 12 studied--not the same combination for each cut, but always included finish grade as measure of fatness.

TABLE 6.--PERCENT VARIANCE IN YIELDS OF CERTAIN CLOSE TRIMMED RETAIL CUTS EXPLAINED BY VARIOUS COMBINATIONS OF MEASURES

Combination	Close trimmed retail cut					
	Round	Loin end	Short loin	Square chuck	Rib	Sum of five
Weight and Depth of fat	53.3	47.0	18.7	37.6	35.7	57.7
Weight, Length of loin, Depth of fat and Round circumference 1/	59.0	68.1	21.9	45.4	40.0	64.9
Weight and Finish grade	56.8	62.7	19.9	51.6	42.0	67.9
Weight, Finish grade and Conformation grade	64.0	67.3	23.0	51.6	43.4	69.0
Best combination	68.0	69.7	23.0	52.5	43.4	70.9

1/ Generally best combination of purely objective measures.
2/ Best combination among the 12 studied--not the same combination for each cut, but always included finish grade as measure of fatness.

TABLE 7.--EFFECT OF DIFFERENCES IN CERTAIN MEASURES ON YIELDS OF WHOLESALE CUTS 1/

Measure	Wholesale cut					
	Round	Loin end	Short loin	Square chuck	Rib	Sum of five
Depth of fat - mm. (with weight)	-.110**	-.042**	.066**	-.121**	.049**	-.157**
Weight - lb. (with finish grade)	-.008**	-.001**	-.001*	.004**	.001**	-.004**
Finish grade - 1/3 grade (with weight and conformation grade)	-.320**	-.023*	.102**	-.213**	.059**	-.396**
Conformation grade - 1/3 grade (with weight and finish grade)	.153**	-.089**	.031**	-.008	.026**	.116**
Round circumference -mm (with weight, finish grade and length loin)	.010**	.002**	.001*	.002	.001	.012**

* Significant at 5% level ** Significant at 1% level

1/ Partial regression coefficients for indicated measure in multiple regression with other measures listed.

TABLE 8.--EFFECT OF DIFFERENCES IN CERTAIN MEASURES ON YIELDS OF CLOSE TRIMMED RETAIL CUTS 1/

Measure	Retail cut					
	Round	Loin end	Short loin	Square chuck	Rib	Sum of five
Depth of fat - mm (with weight)	-.0878**	-.0595**	.0001	-.1360**	.0101**	-.2732**
Weight - lb. (with finish grade)	-.0045**	-.0018**	-.0020**	.0027**	.0020**	-.0037**
Finish grade - 1/3 grade (with weight and conformation grade)	-.2460**	-.0580**	-.0106	-.2375**	.0141*	-.5380**
Conformation grade - 1/3 grade (with weight and finish grade)	.1391**	-.0777**	.0248**	.0115	.0226**	.1202**
Round circumference - mm (with weight, finish grade and length loin	.0092**	-.0018**	.0013**	.0035**	.0007	.0129**

* Significant at 5% level ** Significant at 1% level

1/ Partial regression coefficients for indicated measure in multiple regression with other measures listed.

MR. E. H. COBB: We certainly thank John Pierce for this very enlightening scientific dissertation.

It is encouraging that we have some different approaches to this problem. I think we need still more approaches to this problem, and I am sure that this should have suggested some. I think it is of considerable interest that he was able to explain as much of the variation in some of these cuts as he did, but it might be discouraging that he did not explain more of them.

At this time we had probably better open the floor for discussion. Are there any questions?

DR. BUTLER: John and I have had a lot of fun with these things. We have cut as many kinds of carcasses as this, but we didn't deliberately look for the extreme which, of course, is a really good way of determining what the total range is. I think that Johnnie has hit upon a really good point in that if what he has used can be used on the live animal to predict what the yield of the cuts will be from one individual animal, then I think it is very important. We have tried to do that on some cattle with pretty limited success.

I think, though, that we sure need to examine closely the experience with hogs. After all, the major cuts that we are looking for in these beef carcasses are very similar to the ones we are looking for in hog carcasses anatomically, and I think that we should expect the increased fat to give a decreased yield of these preferred cuts with cattle just like we have found with hogs.

After we have adjusted carcasses that were fed alike that showed a wide variability in conformation to a standard fatness we have found very minor differences in the yield of the sum of the three preferred cuts, that is, the loin, rib and round. Again that should not be interpreted by itself because the loin and the round go in different directions. It is true, however, I believe, that some of the conventional factors that we have laid a lot of stress on in conformation probably deserve much less stress, such as plumpness of round, compactness and short legs. We have not been able to develop any significant differences on those points. It seems to me that we need to take a leaf from the hog experience again on that.

There is no particular reason for coupling the round to the chuck in cattle and looking for longer carcasses. It just does not seem consistent. We think that longer legged cattle tend to have longer shank bones but also longer femur bones, and that you get a greater increase in yield of round from length than you do from plumpness of cattle that show a reasonable amount of muscle.

I believe that we need to look for the meat type steer, and I believe that the characteristics we are looking for in the meat type steer closely parallel the characteristics we look for in the meat type hog.

MR. COBB: Thank you very much.

Along similar lines, at New Mexico we have been following some cattle that have been on experiments through the packing plant, and it has been surprising that cattle selected for large size and those selected for compactness, not completely small size but small size of good conformation, show no real difference in cutout value when carried to the packing plant, and that goes along with some of the data presented at Texas A. and M.

Are there any other questions?

DR. HINER: You may remember -- well, I guess it has been three or four years ago that Dr. Byerly presented a paper at the American Meat Institute Foundation on some of our work at Beltsville, and we made a study for him on yields. In our studies on yields of cattle we base the yield on the round with the rump and shank off, the short loin, the loin end, and the prime rib as a per cent of slaughter weight.

In cattle that had about 15 per cent of their carcass weight in fat we found the lowest yield of these four cuts, and this yield tended to increase to around 28 to 29 per cent of the live weight as the animal fattened up to close to 35 per cent and then it tended to level off. As they got fatter the yield more or less held its own. So we were able to find a definite difference.

We have also been able to find sire differences or line differences in shorthorn cattle. So we do know that there is. And we have found significant differences between the offspring of sires.

MR. COBB: Some of these differences in traits due to inheritance are encouraging, and I am sure there is plenty of room for improvement as indicated.

DR. BUTLER: May I make a comment on that? Of course, Dick and I have talked this over a good many times, and I cannot see any reason to relate these things to the live weight basis, because when you take the dressing percentage out it seems to me that you remove by far the greater percentage of variability. As a matter of fact, just take out the pouch and you take out the greatest percentage of variation. We have tried that, and on the basis of carcass yield we have not been able to develop differences.

DR. HINER: I might say that the reason we use the slaughter weight is because that is the weight the farmer sells the animal. He is interested in how much meat he is selling. We would prefer the empty body weight.

MR. COBB: The point is if you check the dressing percentage and then you check the others with relation to your carcass and you still have the same story but in two component parts.

MR. JAMES D. KEMP (University of Kentucky): I should like to ask Dr. Butler how much support the proposal by the Texas Cattlemen's Association, I believe it is, that conformation be done away with as a factor of grading is gaining.

DR. BUTLER: I don't know. It didn't gain much attention at Texas A. and M. College. We took exception to some of the conclusions that Tobin Armstrong and his committee, representing the Texas and Southwestern Cattle Raisers Association, made. He was using our data and he was also using some of the data that Johnnie Pierce had.

I don't know how much support it received but I will guarantee it is receiving a lot of attention, and in about a week or ten days Tobin Armstrong will make another report to the American National Cattlemen's Association at Denver concerning it.

I believe that in that paper there are some points that should be considered carefully. I think it is an extreme viewpoint, and I don't know whether such a recommendation was made just to attract attention so that some other points could be made or it is really the conviction of the committee.

But I hold with some of the conclusions that were made, in that probably there should be a change in the specification of conformation, and I believe that we should certainly take a careful look at the experience and yield with these meat type hogs and we are going to find pretty much the same thing with the cattle carcasses.

MR. COBB: I should like to give Johnnie Pierce a few minutes on this point.

MR. PIERCE: Good! I wondered if I was going to get a chance to comment after all this dissertation. There are two or three points I should like to comment on. I agree with much that O. D. has said. I disagree with a few things that he has said. This is not unusual for us.

First of all, I certainly agree that we need to take a good look at the effects of these factors on yield. I agree that we should take a look at anything that will contribute in this area. Certainly the hog data is something that we should take a look at, and let's stop for just a moment and look at them. Most people have explained about 70 per cent of the variation in yield of lean cuts by fatness in connection with weight. That still leaves 30 per cent unexplained variation. That 30 per cent unexplained variation is creating a great deal of interest in the swine industry today.

In fact, a major packer was in our office last week and explained the fact that these relationships that we had based our standards on did not properly identify the so-called meat type hog. I have no quarrel with that point of view. I agree with him that it probably does not, and what we are looking for right now, O. D., are some measures that we can use to identify this meat type hog.

We have the same thing in cattle. We have individuals that are quite unusual in their yields, and that is the direction in which we should be selecting but we cannot select in that direction until we can identify those unusual cattle.

Now with respect to the specific points that O. D. mentioned, he said that he didn't think plumpness of round is a factor that should merit much emphasis from his data. I would say from looking at ours that we would take the opposite point of view. Actually circumference of round or thickness and plumpness of round as evaluated visually was one of the most promising things that we used.

You will remember, or maybe you won't, from the slides that were up here, four inches more circumference of round within the same weight group will increase the percentage of round by 1 per cent of the carcass weight. It is not unusual to find 4 inches more in circumference of round. A full grade of subjective evaluation here increases the percentage of round about 1/2 to 1 per cent.

Our relationships for some other cuts were not as promising, such as the short loin and rib. I personally think part of the trouble there from the standpoint of conformation is that we are unable visually to evaluate differences in muscling in carcasses of those cuts while we are probably quite conscious of differences in rounds.

I also agree, O. D., that some of these conceptions that we have had merit a new look. I would agree with you particularly on the length of the loin. The length of the loin certainly increases the yield in that part of the carcass other things being equal.

Actually, commenting on this proposal that has been made, I don't see that we will gain very much from eliminating the variable, but I think we might gain considerably from reévaluating our standards on the basis of what we know, and certainly we would benefit greatly with better measures.

MR. COBB: Thank you, John.

DR. BRATZLER: The so-called 70 per cent variation is explained in this hog cutout, and if you noticed on John's first chart the cattle were selected like the hogs were, on which I think a lot of these standards are based by Cells where they had as many in the upper range as they had in the lower range and the same in the middle. The boys who are working with hogs find that the cutout as measured by backfat is considerably less than 70 per cent, and I think you will find when you get to working with these cattle that you will have a more normal population. In other words, more of the carcasses or the animals in the middle rather than having the same on each end and all the way through.

I would say that instead of 70 per cent of the hog carcass variance being explained by the backfat measurement, it is closer on the average maybe to 55 or 60. That may be one reason the packer is very much concerned, that is, because it does not go even as high as 70 per cent which your .8 correlation value -- .84 or something like that -- would figure out.

MR. COBB: Thank you.

I am afraid that we have used up our 15 minutes. It is encouraging that there is so much discussion. I hope that some new ideas have been created.

We will now turn it back to O. D.

DR. BUTLER: Thank you.

I want to say only one last sentence on this. I surely do not want to be classed as one who does not favor consideration of conformation because I do favor consideration of conformation. I think as to the things that we are looking for in conformation emphasis needs to be placed on a little different set of characteristics than the grade specifications now call for.

Last year we had some fun trying to get agreement on coding of beef carcass grades, so that we could be speaking in the same terms when reporting research information, and the proposal was voted down. After that I distributed the proposal for a little more careful consideration, and we received a lot of comments concerning it. I don't know whether we can agree to use numbers and to use arithmetic in reporting these things or not, but if we can we ought to agree on using the same set of numbers. Maybe we started too far along. I don't know. Maybe we should try to get agreement on whether to use the English language in reporting these things. Maybe we can get agreement on that. Do you think we ought to vote on that, Lyman? But anyway to present the comments on this proposal I should like to present Dick Hiner of the U.S.D.A. (Applause)

DR. HINER: Mr. Chairman and Members of the Reciprocal Meat Conference: As O. D. has told you, we presented this resolution last year. It is probably brought about somewhat by the fact that we are getting into a lot of statistical analysis of our grades, especially with the use of IBM cards. As you probably are aware, at least I am anyway, practically all of our data now is being transferred from our regular system of recording data to the marked sense cards and are then transferred from there to the IBM cards. So for the last several months I have had a good deal of fun arranging the marked sense cards. If you have had any experience with that you have had somewhat the same experience I have had.

Now when we introduced this resolution a year ago there was quite a bit of comment that there should be whole numbers, that there should be third numbers, and that there was a variation between your choice and your good that was not brought out by an even distribution of numbers. Some of you were using the large numbers as the best animal, and some of you were using the small number as the best animal. A lot of of you were following the 101 and 102 forms. They list No. 1 as the ideal that you never find, No. 2 as the top prime, 4 straight prime, 6 low prime, and on down the scale.

Last September, in order to help to clarify this, Dr. Butler circulated a letter among all the men that he thought would be interested in a standard system for reporting grades. At that time he suggested that

we start with 1 for high prime and on down the line. You may remember that he suggested an example here as to the effect and how this would operate and, of course, his coefficient of variation came out the same.

There has been one objection to using the system that he proposed. That objection has been that when you make your correlations you come out with a minus quantity or a minus correlation. Of course, the only thing you have to do is to put a plus sign on it. However, as forgetful as some of us are we will forget that and as a result somebody will be misinformed.

The replies to all the letters to these people number 40. Practically all of them agreed that a whole number was satisfactory, and as far as dividing it up into thirds of grades, that is, the numbers by thirds, it was not worth while. Some of them wrote quite long dissertations and explained it. They got into more mathematics than I am able to explain, especially one of them.

It seems as though in these regional breeding laboratories, especially the North Central and the Western, and I guess somewhat the Southern, they have already adopted somewhat of a uniform system for the grading of their animals, especially the lean calves and the animals that go into the breeding herds, and that some of them even have a uniform code for reporting their steers.

There has been somewhat of a difference of opinion here. Quite a few of the men prefer to start with No. 1, thinking that No. 1 is the ideal animal. I personally have thought of it that way and several of the others have. Others have thought of the No. 1 as the poorest animal. However, the majority of those who reported think that No. 1 should be the lowest. As far as statistical work goes it makes no difference.

The only thing that is of a little concern to me and may not have been mentioned before is that those of us who work with meats are not only working with beef, we are working with hogs and we are working with lambs. If we start out with one system for cattle should we have the same system for lamb and for hogs to keep our thinking along the same line? So far the only grades we have are those for hogs. Of course, No. 1 is supposedly the best hog, although I understand that in New York that has been modified to better hogs even than No. 1. So that we still have disagreement there.

Another thing that may have had an effect is the division of the commercial grade into standard and commercial. That division, I believe I am correct in saying, is made entirely on age or that is a prime consideration. Some of these commercial cows are pretty fat cows. If you made a uniform system from 1 through 24 including your cows that you might have to be putting into a study -- for instance, if you are trying to find some measure, some ratio or something that will predict a yield or some other characteristic that you are interested in, these commercial cows in the middle there may have some influence on the outcome of the correlation. I know that cows have been slaughtered there at the laboratory that had been graded commercial that had as much fat probably as our

choice, and yet as far as the quality of the animal, the age, etc., were concerned they were graded commercial.

The proposal that we are presenting this morning, however, starts with No. 1 as the low canners, and it goes consecutively through the grades to No. 24 as the high prime. However, I believe that we are going to have to remember when we report any correlations that are made or in making any correlations that the first four grades, prime, choice, good and standard will have to be used in the correlation unless the utilities, cutters and canners are approximately the same class of beef. However, I believe that most of your commercial, utility, canner and cutter will probably be in the cow class. That is one thing that we are going to have to watch out for.

So on the basis of these considerations and the replies that we received from this questionnaire, the Beef Carcass Evaluation Committee is introducing the resolution that we have a uniform coding system for coding our beef carcass data starting with No. 1 as our low canner, going consecutively through the grades to No. 24 as our high prime.

DR. BUTLER: Thank you, Dick.

He has put that in the form of a motion, and I should like Carl Schoonover to lead the discussion and see if he can get a second.

MR. C. SCHOONOVER: Thank you, Dick.

It appears to me that it is quite important that this Tenth Annual Reciprocal Meat Conference adopt some type of grading system, some uniform coding system. Certainly in reviewing the literature it becomes a little difficult to run into various types of reports and to have to read the footnotes to find out what each investigator is actually reporting.

You have heard the report of the committee and now I will call for discussion.

MR. ADAMS: Is that a motion that should be seconded?

DR. NAUMANN: It is a motion, yes.

MR. ADAMS: I second the motion, and now I should like to discuss it. On the blackboard over there I have written the scores that I had to go through on the paper that I presented this morning. You can see there it gets a little complicated. You have to stop and figure out what each institution is trying to present when they put the grades in the form of scores. I might say that 40 of these in the review of the literature that I have given here use the grade name, high choice, average choice or low choice which made it simple for me to go through. But you can see that we have quite a variation there.

For that high choice you will notice over in that one group that I put together they started with 8, 14 and 15. That is all from one

institution. I am embarrassed that it happens to be my alma mater. In their reporting in the Feeders' Day report this year they used three systems for coding their grades. I think that it is about time that we use such words as prime, choice and good or a uniform numbering system in reporting. I don't care what you use in your own institution, but when we put it down on paper and we start to put it out for everyone else to read let's all be alike so that it will be more simple.

DR. BRATZLER: If you go consecutively, Dick, you have a difference of three digits between standard and utility for young cattle. Would there be any harm in having the standard and commercial grades the same number? If you were working with older cattle you would call that group commercial and if you were working with younger cattle they would be standard. I don't think we ought to have that much spread between standard and utility with commercial in between.

DR. HINER: I don't know that that makes any particular difference. I would hate to see standard and commercial the same numbers because I am sure there would be more confusion than there is now and there is plenty the way it is. It would be the same as if you had choice and standard without any good animals in your study. You would have a gap.

I recognize and I am sure all of you recognize that there is not a uniform stepdown with each one of these numbers. There is probably more difference between good and standard than there is between choice and prime. That, of course, I believe would come out in your statistical analysis.

I might also add that this gets away from all the decimals. It is much easier to work with whole numbers on IBM cards. Also in your statistical analysis.

But as far as I am concerned and from what I have learned in talking with our statistician, Dr. Harvey, skipping that grade does not make any difference in the correlation.

MR. SCHOONOVER: Is there any more discussion?

DR. MACKINTOSH: With reference to the variation in the method of designating grades referred to by Charley a few moments ago, I was not there and I cannot help it. It is possibly the result of the invasion of our institution by representatives from other institutions, and I was not there to smother it. (Laughter)

What I got up to say is that with that variation there is evidence of the need for all of us, at whatever institution, to use the same system. The variation there is because of the method used by others in the institution without consulting those working on meats. If we could only get the nutrition men to think in terms of meat instead of feed, I think we would have accomplished something, because there we have the nutrition men using their system instead of that which has been suggested by the meats men.

It is necessary that we adopt a uniform method.

DR. J. W. COLE (University of Tennessee): I am sort of in favor of using word descriptions the way we have them, and then code them any way you want for statistics. I think that would get away from the standard and utility jump that you have. Like Charley, I think there is nothing easier to understand than high choice or average choice or high good. You know exactly what it is. You don't have to start to calculate mentally what grade it is, and I sort of think prime, choice, etc. is just as good as anything we can adopt.

MR. SCHOONOVER: Thank you. I believe our time is running short. We have a motion and a second before the house. Will you take over for the voting?

CHAIRMAN BLUMER: You have already had your discussion. Is the question called for? The question is called for. All those in favor of the motion signify by saying aye; opposed.

DR. BUTLER: You had better have a hand count.

DR. COLE: What is the motion? (Laughter)

CHAIRMAN BLUMER: Well, I won't attempt to state the motion verbatim, but basically it is that we adopt a scoring system that will be universal. We are beginning with the high numbers for prime and going down to the low numbers for the lower end of the grades or canners. That makes a lot of sense to me because we have just recently run correlation coefficients the other way and most of the measurements are positive; that is, you run from high to low. So when you interpret these correlation coefficients you always have to think: This is negative but the results are positive. Even though you go through that yourself, occasionally you will get caught by saying: Well, we got negative results. Or we got positive results. But actually on paper it will show the opposite.

So I think this system of going from high to low is very sound. That is essentially what the motion is, and we want to adopt here a coding system which we can refer to in our proceedings as we do with carcass measurements, etc. in reporting scientific work. It will certainly make the job a whole lot easier if we will do that and much less confusing.

DR. COLE: I have one question; that is, are we going to report them by numbers or are we going to report them by name grades in our writeups?

CHAIRMAN BLUMER: Well, I think you can do both.

DR. COLE: I can see merit in statistics, in fact, we do that, but on the other hand I don't see any merit in reporting numbers rather than grade names.

CHAIRMAN BLUMER: You can do both. I think that could be left up to the individual authors, and if we develop a scoring system we will

indicate in that scoring system that 24 is high prime and 1 is low canner. So if you want to use the grade numbers and numbers, okay, and if not, just use the numbers or the grades. I don't think that would lead to any particular complication.

There is some difference of opinion and the Chair has been contested, I guess, as to whether it is aye or nay. So we will have a show of hands. All those in favor of this motion raise your right hands. I don't think it is necessary to run a count, but let's have a show for the nays. The ayes have it. The motion is carried. Of course, the majority rules in this case.

DR. BUTLER: An overwhelming majority rules, wouldn't you say?

CHAIRMAN BLUMER: Yes.

We are very grateful to O. D. Butler and his committee for this fine report and the discussion that followed. We had to cut the discussion off in almost every case, and that certainly is proof that interest was developed in the presentation of these papers.

MR. PIERCE: Before you get away from this subject there is just one comment that I should like to make, and that is that I should like to suggest that the Beef Carcass Evaluation Committee consider a uniform scoring chart as well as a coding system. Perhaps that is a matter that could come appropriately during the next year. A number of people have written to us asking for the scoring chart that is used for evaluating experimental animals and, frankly, we feel that the one that has been in use for some 25 years has perhaps served its usefulness and it is certainly quite obsolete at the present time.

We have one that has no official status. It is something we would be glad to turn over to a committee for improvement, refinement, or whatever you want to do with it. But I believe that there is a real need for some work in that area, too. You are primarily interested in reporting the characteristics of the carcasses that you grade, but in reporting them in terms of the standards, as I understand it; otherwise, there isn't much point in associating them with grades and certainly the chart that is now being used does not do that - I say the chart that is being used by some of you.

CHAIRMAN BLUMER: Thank you, J. C.

MR. BRANSON: I should like to raise a point at this juncture. I have to leave within a matter of an hour or two, and I remember, going into the consumer preference situation, that the person who presented the run-down of the work that was being done said that he had had considerable difficulty in finding out who was working on what. This is a pretty general situation, I think. I would appreciate it if some action could be taken, but I am not familiar enough with your organization, Mr. Chairman, to know what should be done. Maybe just the Executive Committee can handle it, but I think it would be a help to those of us who are in agricultural economics or in other departments if someone would

take the responsibility of getting information as to who the people are who are working on consumer research with respect to beef, in order that we can facilitate interchange of information and compare technics. We are trying to do this to some extent through the American Economics Association meeting, but if that could be done I think it would be a help to a number of us.

CHAIRMAN BLUMER: Thank you.

First of all, on J. C.'s comment, with your permission, in the interest of time, I should like to refer it to the Beef Carcass Evaluation Committee for next year.

And Dr. Branson's statement requesting information regarding consumer research to the Consumer Research Committee. If there are no ojbections, we will do that.

This brings us then to the Pork Carcass Evaluation Committee. The Chairman is C. L. Strong, of the U. S. Department of Agriculture. Charlie. Somebody says Lowell, but I first learned the name Charlie and I keep referring to him as Charlie and it really was not a slip.

DR. C. L. STRONG: I answer to both and you may call me anything except too late for breakfast.

Thank you, Tom.

You will note that the general theme of our program concerning pork is "Improving Pork Carcass Evaluation," and the papers that we have for you are primarily pointed toward some aspect of evaluation of pork carcasses with this improvement theme in mind.

One of the things, of course, that is receiving increasing attention from the standpoint of carcass evaluation is some way of getting at differences in thickness of muscling. We see it in evidence in our various evaluation programs, including the certification programs of the breed associations and such things as that. So to give us some information and to pull the ends together on what is being done and what the prospects are on measuring differences in muscling, we have Al Pearson from Michigan. (Applause)

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MEASURES OF MUSCLING IN PORK CARCASSES

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The increased emphasis on production of more lean meat per unit of weight, has resulted in added emphasis being placed on muscling in pork carcasses. This, of course, raises the question as to what are the best measures of muscling and how they are related to cut-outs. Furthermore, one might ask what the relationship between shape or size of the muscle in cross-section is as compared to total muscle mass? Thus, for the purposes of this paper, I will attempt to discuss the more common methods of measuring muscling along with a few other methods, trying to point out some of the advantages and basic weaknesses of each method.

In measurement of muscling, one of the major problems is establishing the validity of the different methods. To do this, it is first necessary that standards be set up which accurately reflect muscling and can be used to validate new methods. Unfortunately, we have little information available which will make an accurate comparison possible. This is true primarily because of the basic concept that methodology is an unproductive field of endeavor. Thus, it is necessary to start with basic information on the composition of skeletal muscle, since this is our primary interest. Dukes (1943) gives the following composition of mammalism skeletal tissues:

Water	75%
Protein	18-20%
Carbohydrate (mainly glycogen)	1%
Soluble material (non-protein and non-carbohydrate)	3-5%
Fatty Acids* (minimum)	0.5-1.0%

*May be much higher due to increased storage fat.

It is obvious from the above table that there is great variability in composition of muscle tissues. This is especially noticeable in regard to fat content, and to some extent with moisture, which tends to vary inversely. Since muscles differ in intramuscular fat or marbling, basic information is needed on the effect of marbling on tenderness, juiciness and flavor. Work with beef, recently reported by Cover et al. (1956) indicates that the effect of marbling on tenderness is not a simple clear-cut relationship, but apparently other factors besides marbling are involved. It has been generally accepted that excessive fatness is undesirable in pork carcasses and though results indicate this to be true (Birmingham, 1956), we do not have information available indicating how far we can go in the opposite direction and still satisfy the

consumer. Furthermore, it is conceivable that we may have considerable muscling present in combination with excessive fatness, whereas a hog carcass may be lacking in fatness but still be deficient in muscling.

There would appear to be two valid measures for determining muscling of pork carcasses, first, dissection and separation, and second, chemical analysis. In my opinion, these are valid means of measuring the reliability of other methods for determining muscling. However, failure of other methods to be in complete agreement with these two would not preclude their usefulness under certain conditions. Consequently, I shall discuss each of these methods pointing out some of the short-comings and advantages.

The dissection-separation technique has been used extensively by Hammond(1921 and 1932) and others of his school (McMeekan, 1940; Hirzel, 1939; Palsson, 1939) for carcass evaluation. In this country it has been used by a number of workers (Hankins and Ellis, 1934; Hankins and Howe, 1946; Loeffel et al., 1943). This method has the advantage of including marbling with the lean tissues and in addition, gives one an opportunity to observe shape, color and other physical attributes of the muscles. However, it is a slow, painstaking task that involves subjective decisions in dividing the tissues into the component lean and fatty classifications. In addition, losses due to evaporation or absorption are possible added sources of error. However, in spite of the short-comings of the dissection-separation technique, it appears to be a valid measure of muscling.

Next, let us consider chemical analysis as a measure of muscling. Numerous workers (Warner et al., 1934; Hankins and Ellis, 1935; Callow, 1945 and 1948; Brown et al., 1951; Whiteman et al., 1953b; Price et al., 1957) have used chemical analysis as a method of measuring leanness or fatness. Although chemical analysis is rather diffiuclt to obtain on meat samples due to problems in sampling, it is easier and less tedious than the dissection-separation technique. It has the disadvantage of not including marbling in the lean tissues, but instead includes intra-muscular fat with other ether soluble material. Furthermore, chemical analysis gives an index of muscling only from the percentage viewpoint and ignores shape or appearance of the muscles. However, because of the relatively simpler application and the sound principles on which it is based, chemical analysis would seem to be a good measure of muscling.

The area of the "loin eye", or Longissimus dorsi muscle of the loin, has been the most commonly accepted measure of muscling in carcass studies. Failure to standardize the point of measurement, the muscle to be traced and the plane of cutting through the muscle have resulted in variability in results. Kline and Hazel (1955) have shown that the area of the "loin eye" was larger at the last rib than at the 10th rib and concluded that it made little difference which was used as long as it was standardized. Consequently, breed certification programs have generally adopted the area of the "loin eye" at the 10th rib. However, certification data reporting values above 6 square inches of "loin eye" may be viewed with some doubt, and it is likely such values are due to inclusion of the multifidis dorsi muscle or other small muscles adjacent to the "loin eye". It is well known that cutting of the "loin eye" at an angle greater than 90° will also increase the area. In addition, it is possible to increase or decrease the area of lean by pressing

against the muscle. In order to minimize changes due to altered surface area of the "loin eye", Bratzler (1957) began taking all tracings on the rough loin. This gives rigidity to the muscle and reduces errors due to altered surface area.

The loin area tracing is simple to make and allows one to accumulate the tracings for more leisurely measurement. Along this line of thought, it should be possible to develop an electronic device, which would read off the area directly. In addition, to possible sources of error in determining the loin-lean area, there is no concrete evidence that loin-lean is closely related to muscling in the remainder of the pork carcass. Data on cut-out and chemical analysis would indicate that "loin eye" is not closely correlated with total muscling of the entire carcass (Kline and Hazel, 1955; Price et al., 1957).

Specific gravity measurements have been used to ascertain leanness and results indicate that specific gravity more accurately reflects the loin-lean area than backfat thickness (Pearson et al., 1956a; Price et al., 1957). In addition, a higher correlation was obtained between the area of the "loin eye" and chemical analysis of the ham than was true for backfat thickness, which tends to verify the relationship between muscling and specific gravity. Oklahoma workers (Brown et al., 1951; Whiteman et al., 1953a and 1953b) found chemical analysis to be more closely related to leanness than backfat thickness. Similarly, Liuzzo et al., (1956) reported percentage fat and water specific gravity were closely related with an "r" value of +.99. Thus, results would indicate that muscling is accurately reflected by specific gravity. However, specific gravity of the entire carcass or a single ham may not be closely related to loin-lean area. Unfortunately, specific gravity has not been a real good measure of cut-outs, but it should be mentioned that cut-outs are not free from variability as shown by errors in cutting opposite sides of the same carcass (Lasely and Kline, 1957).

The live probe and lean meter have both been used to predict backfat thickness (Hazel and Kline, 1952; Andrews et al., 1954) in the live animal and may possibly be useful in the carcass. Interestingly enough both measures have more accurately indicated cut-out on the live animal than was true for backfat thickness (Hazel and Kline, 1952; Pearson et al., 1957b). However, Price et al., (1957) found little difference between the two measures insofar as their relationship to the loin lean area is concerned.

Backfat has been used as an indicator of carcass value, and therefore, it would be assumed that it is related to muscling. Warner et al., (1934) showed backfat thickness was related to carcass cut-outs. The North Central Livestock Marketing Research Committee (1952) reported backfat accurately reflected lean cuts on the carcass basis with an "r" value of -.84 and this was verified by Henning and Evans (1953). However, other workers have failed to obtain such high relationships (Brown et al., 1951; Whiteman et al., 1953a and 1953b; Pearson et al., 1956a; Price et al., 1957; Whatley et al., 1957). Although backfat is a simple measurement to make, it is obvious that even though it reflects cut-outs, it is not closely related to muscling.

Other measurements that have been suggested as possible measures of muscling include the defatted ham (Durham, 1957), the depth of lumbar lean (Bray, 1957), the area of the outer lumbar muscle (Pearson and Bratzler, 1957), all of which are not described in the literature. In addition, blood fat levels (Bowland and Hironka) have been reported to be related to area of loin-lean and to backfat. This has been partially verified by Morrow et al., (1956) but other variables have complicated the picture and make further study necessary. Other possible measures of muscling in the live animal include the helium dilution technique for determining specific gravity on intact animals or humans developed by Siri (1956) and the air displacement method (Liuzzo et al., 1956). To date both methods need further validation and verification. Another suggested method of obtaining body volume is by photogrametry (Pierson and Montoye, 1957), although this method has not been used for this purpose, such usage has been suggested.

Additional carcass measurements such as length have been used, but results indicate low relationships with both muscling of the loin and cut-outs (Pearson et al., 1956b). Some simple cut indices have been used for evaluating pork carcasses (Pearson et al., 1957a), and in general, the loin indices would appear to be the most promising measure of muscling - at least as judged by relationships to cut-outs and "loin eye" area.

In conclusion, it is suggested that chemical analysis and physical separation are valid bases for development of sound techniques for measuring muscling in pork carcasses. Although a number of methods are available for measuring muscling, it is believed that validation of the available methods is needed.

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DR. STRONG: Thank you, Al, for bringing us up to date and taking a look at one of the rising stars that has come into prominence for use in pork carcass evaluation and what has been done at various points with regard to measuring of muscling.

Another aspect that we are interested in when evaluating pork carcasses, of course, is quality. You all realize that this is absolutely non-controversial. We have talked about it for the last three or four years at times, and we are all in complete agreement on it. However, so that you will know what we are in agreement on, since you may be confused from some of the discussions since George Wilson covered this subject back in 1953, we have asked Ernie Briskey, from Wisconsin, to give us a little reevaluation of this quality factor. Ernie.

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SOME FACTORS CONTRIBUTING TO PORK QUALITY

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Why are we concerned with pork quality? Why is it? Is it of economical importance? These are commonplace questions that have plagued us for years. This disturbance has been striking wide areas of interest -- from consumer surveys to muscle chemistry studies.

There are many areas in which pork quality definitions may be proposed; none of them, however, are concrete. The consumer surveyor, for instance, may consider quality in terms of eating satisfaction. The industrial man -- more with product uniformity, ease of processing, saleability and yes --also satisfaction with the ultimate product. The scientific researcher perhaps is more concerned with the why's and how's of muscle differences and responses. All of these areas are important. Through a grouping of findings or at least ultimate efforts we can perhaps more firmly secure and understand pork quality.

The need for product standardization is most apparent. This need expresses itself many fold in terms of pork quality.

1. The acceptability of pork is in question in certain parts of the country. Selection of products by Federal grade to increase lean to fat ratio has not completely alleviated this problem. The muscle -- the ultimate product that is cooked has to be studied. Certainly the production and processing of uniformly appearing products is a means to this end.

2. In addition to appearance of fresh pork products, the cured product condition is of equal if not of greater importance (in terms of quantity) I think we have observed sufficient products to rule out the old theory that appearance of fresh products is of little interest because they all look alike in the cured form. We know that this is not the case. We are further confident that variations in appearance present perplexing retail problems because of lack of uniformity.

3. Weight and probable nutrient loss are other reasons for product differentiation. If according to appearance classification these cuts reflect themselves differently in the diet, they are most significant.

4. Last of all, and perhaps most important -- if these graded cuts are more tender, juicy and flavorful -- would it not be wise to effect standards to the point where the consumer would have a guide to product desirability.

These are just reasons why presumably pork quality is on the up-rise in importance from the view point of today's critical consumer.

I was assigned the task of re-evaluating pork quality. Since quality has never been defined, a re-evaluation of it would be quite difficult. Perhaps to paraphrase it in terms of factors of importance in quality evaluation would be more desirable in view of the type of information which I hope to present.

Wilson, several years ago at these meetings, was assigned the topic, "How Important is Pork Quality". In brief, he referred to quality in terms of firmness, color, marbling and texture. These terms of course, have been quality phrases for decades. The degree of each factor required to reflect the much misused terms, quality, has been passed down, arbitrarily, as we so well know. The degree of this vagueness was summarized quite well by Kastelic at the same conference, where he termed it, "A rather nebulous term involving objective estimations, a considerable amount of subjectiveness, and many intangibles."

I am confident that there are still copious intangibles and probably too much subjectiveness. I do feel, however, that during the last few years some progress has been made toward the uncovering of some seemingly important quality indicators. Even in view of this progress, I think a quality appraisal would still include the quality indicators that Wilson discussed four years ago. Perhaps, muscle water release and odor should also be incorporated to stay in line with present day thinking.

I would like to briefly acquaint you with the work of Self at Wisconsin on the pork odor problem. A survey was taken in a Wisconsin packing plant whereby diaphragm tissue samples were obtained from approximately equal numbers of male and female pork carcasses. The samples were identified, wrapped in aluminum foil and heated under infra-red tubes to approximately 200 degrees Fahrenheit. The foil wrapper was then released allowing the volatile substances to bathe the nostrils of the tester. The following slide shows the results of this test.

(Slide I) Surprisingly enough the odor incidence in males and females is very similar. This apparent appearance of odor without regard to sex should cast a reflection on our pork quality thinking. Certainly even though a particular muscle reflects whatever attributes we might dictate as quality, we should be cautious in calling it a quality product, if it possesses offensive or even slightly objectionable odors.

(Slide II) The fact that out of 30 boars studied, only five showed evidence of odor raises further questions as to the odor source. Perhaps this new area of interest should be given consideration in subsequent consumer surveys.

Some surveys have shown consumers to prefer the unmarbled instead of the marbled chop. Is this the right avenue for us to direct our thinking? Do we have any evidence with quality in mind for decreasing the emphasis on pork marbling? Our pilot test at this conference a year ago seemed to indicate that we have no sound basis for minimizing this factor as a quality attribute. A very high percentage of participating persons found definite distinguishing features between the marbled and unmarbled chops. It should be

pointed out that the results could have been due to factors other than marbling, but the results were provoking enough, I think, to direct more attention to the importance of marbling.

Several attempts have been made to check the consumer satisfaction with pork, using the federal grade standards, as muscle quality indicators. I think that without particular muscle quality evaluation, the results might be quite misleading. Federal grade standards express primarily differences in lean cut yield and do not show the relationship between carcass grades (U. S. No. 1, No. 2 and No. 3) and the quality of the meat cut. This relationship has recently been studied by Self, Bray and Reierson (in press). These workers developed their own specifications for ham and loin grades. These grades were established in line with factors that were considered to be important from the viewpoint of the consumer when she selects meat in the retail store.

Loin Grades.

1. The loins that were graded No. 1 were full and meaty, firm to the touch and had minimum quantities of intermuscular fat (seam fat) color of lean was desirable.

2. The grade termed No. 2 contained loins that were moderately to heavily muscled with a moderate amount of intermuscular fat. Color of lean was desirable.

3. Loins falling in the No. 3 grade were either light or heavily muscled, had excessive seam fat and excessive marbling. Color of lean was not considered.

4. The last grade, No. 4 was established for loins that were soft to the touch, had a watery type lean with little or no intermuscular fat or marbling.

The last two grades differed from the others in that they were considered undesirable for retail trade.

Photographic standards were used in the grading process. Approximately 600 carcasses were used in the test and they were categorized according to sex and weight group.

Loins grading No. 1 and No. 2 were produced by 86.6% of the U. S. No. 1 carcasses; 76.6% of the U. S. No. 2 carcasses; 66% of the U. S. No. 3 carcasses and 55.1% of the medium carcasses. The 20% drop between the No. 1 and No. 3 was ascribed primarily to the increase in seam fat and excessive marbling. On the other hand the 30% drop between the U. S. No. 1 and medium reflects primarily the high incidence of watery type lean in the medium pork carcass.

Doesn't this indicate, without doubt, that we are at a critical point in fat back reduction by grade in our effort to increase lean yield? I think we should very definitely learn more about quality and its importance before any attempt is made to reduce the minimum backfat requirement for a U. S. No. 1 carcass below the present standard.

Ham Grades.

Three ham grades were established.

1. The hams that were graded No. 1 were heavily muscled, firm to the touch, contained a minimum of intermuscular fat and were uniformly light pink in color.

2. The hams termed the No. 2 grade were two-toned in color (both light and dark colored meat on the butt end) and had a watery type lean. Muscularity was not considered.

3. The hams graded No. 3 were light muscled, firm, and had excessive intermuscular fat. Color was not an important consideration in the grade.

Only the No. 1 grade hams were considered as acceptable for use as whole hams or as whole ham products in the retail trade.

The point I wish to make here is that the No. 2 grade ham differentiated largely on the basis of "two-toning". This condition did not appear to be associated with weight, sex, carcass length, percent lean cuts, or loin grade.

Since pork research in general will be covered by my successor on this program, I wish to move on to a more thorough discussion of muscle color, wateriness, firmness and texture as it may be related to eating quality of pork.

(Slide III) The slide which I wish to show at this time reflects three major ham groupings on the basis of appearance. On my right you see what I wish to call the maximum allowable darkness for standard processing methods. Next to this cut is a ham that is objectionably dark. Although it is probably presumptious on my part, I wish to call the next cut a normal ham. Proceeding to the left, we see first a tolerable degree of "two-toning" followed by extreme cases of soft, pale watery hams.

Now let us look at them in respect to the three groups which I previously mentioned, namely, dark, normal and extremely two-toned. Am I wrong in thinking that these differences are significant? If they are so notably different might we not assume that there are quality differences in these conditions?

Ludvigsen defined muscle degeneration in Danish hogs in a way that the characteristics stated resemble the last two hams on this slide. Apparently it occurred quite frequently in all muscles where he termed it "Total degeneration" and in other cases, seemingly less severe, only in the ham and loin. He has associated this condition to water binding difficulties which might be related to the palatability of the meat.

I think that "wateriness" in hams is an important result of marked changes in muscle chemical characteristics. Cole also found this to be true in his study of fat firmness. In his study, he found that the higher water

content of underfinished carcasses caused a significant evaporation difference. If the percentage of water has this effect why wouldn't the status of the water binding be equally as important - or maybe the two are related in this case. We have collected considerable data in an effort to understand the relationship of several of these chemical and physical characteristics as they appear in certain muscle types.

In one study we grouped part of the hams into two groups which resembled the types of hams shown on the following slides.

(Slide IV.) Group I. Two toned.

(Slide V.) Group II. Uniformly dark.

The next slide shows part of the data collected on hams resembling these colored slides.

(Slide VI.) pH Variation by Muscle Group

pH	Group I	Group II
Light		
40 minutes	5.57	6.40
24 hours	5.48	5.87
Dark		
40 minutes	5.86	6.53
24 hours	5.83	6.30
Myoglobin (mg my) gr. tissue)		
Light	.94	1.18
Dark	3.43	4.80

Although little difference was noted in myoglobin concentration, a marked change in muscle pH was observed.

Of what importance are these characteristics to pork quality?

If we assume that pH determines protein charge and that this in turn dictates the degree of hydration of the proteins, then we might expect the pH to reflect the so called wateriness. This is further directed to a quality implication by the work of Hamm who postulated that tenderness is associated with pH. His thinking is that with a minimum charge, or a low pH, you have less water held between the polypeptide chains, the meat is more compact and consequently less tender. Perhaps some of our seemingly important texture differences manifest themselves in this way.

I pointed out that in these two particular groups there were no differences in myoglobin concentrations of similar muscles. I do not mean to imply that color variations in some cases cannot be distinguished by quantitative differences in pigments. I am sure that in some cases this is true. Likewise it's resonable to believe that the oxidation state of the myoglobin

might be changed and hence a color difference with no appreciable change in pigment quantity.

Hamm has proposed two theories for muscle color. One is the pigment as I have just discussed. The second theory is that the muscle consistency as dictated by pH and degree of hydration might reflect differences in the degree of light ray penetrating into the muscle. Thus, at a low pH the light reflected from the upper layers of muscle fibers as a result of a more dense structure, causing the muscle to appear light red. At a higher pH, the light ray penetrate much deeper in between the protein molecules, thus causing the muscle to appear dark red. I merely present this for out thinking -- not as an actual fact.

We have recently finished collecting data on another experiment with the aim of following some of these changes through the chilling process. Detailed reports of this work are forthcoming, but I wish to show some of the relationships which we found between muscle type, pH, tenderness, flavor and cooking loss.

The animals were processed at the University Meats Laboratory. The pH readings were taken before scalding and after a 24 hour chill. The samples for the cooking analysis were removed 24 hours after chilling, wrapped in aluminum foil and held at 35° for five days. At that time coded samples were placed in individual aluminum foil pans, covered with foil, and baked in the same oven at 350° F. for one hour.

The tests for flavor and tenderness differences were made by a ten subject "expert" panel composed of trained Research Department personnel in a local packing plant.

(Slide VII.) This slide shows the photographic standards used for grading the hams in this experiment. Please try to remember the appearance of these ham classifications as we move on to the next slide and a discussion of the aforementioned collected data.

(Slide VIII.)

See the attached sheet.

A comparison of the adjacent dark and light muscles of individual hams indicates that the dark muscles are significantly more flavorful and tender than the light muscles. On the other hand, if we compare similar muscles we observe no significant difference in tenderness and flavor due to appearance or grouping. It should be mentioned however that as we approach the uniformity colored classification there seems to be an apparent increase in tenderness, and flavor.

The loss in weight due to apparent moisture loss is quite interesting. This factor seems to align itself inversely with pH in a rather consistant manner. It's certainly conceivable that the water soluble substances lost in this liquid might be of marked importance. Certainly this should be of economical importance.

In summary the individual ham muscles may be distinguished one from another quite easily on the basis of physical and chemical characteristics. The light muscle may be distinguished from the adjacent dark muscle in the following ways: Lower pH, greater water release, lower myoglobin content. Data from a limited number of hams seems to indicate that the light muscles may also be distinguished from their adjacent dark muscle by a lower sodium and higher potassium content. A comparison of large light muscles of various hams is considerably more involved. I hope in this discussion that I have at least raised one point that is that with pork cuts of such gross differences in appearance we are encountered with a multitude of different chemical and physical features and responses. A more thorough understanding and appreciation for these widely varying characteristics will undoubtedly lead us to a more secure position with the term pork quality.

The Wisconsin station is embarking on a project to study the many and varied pork muscle characteristics. Perhaps in the not too distant future, in cooperation with other stations, pork quality can be equitably defined and appropriately and effectively applied for the benefit of the producer, consumer and processor.

pH AND COOKING DATA

Ham classification*	Ham muscle**	pH		Cooking loss		Taste panel	
		Fresh	24 hrs.	Evaporation	Total loss	Tenderness	Flavor
				%	%		
1 - 2	a	6.22	5.39	12.54	34.88	2.43	3.7
3 - 4	a	6.38	5.54	11.80	33.91	2.47	3.9
5 - 6	a	6.34	5.90	10.14	33.28	2.42	3.7
1 - 2	b	6.20	5.67	19.98	38.40	2.84	4.1
3 - 4	b	6.39	5.86	20.04	35.29	2.94	4.3
5 - 6	b	6.30	6.05	15.92	34.48	3.57	4.1

*As indicated on preceding slide.

**a = light outer muscle.
b = dark inner muscle.

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DR. STRONG: Thank you, Ernie, for bringing up some of these points about pork quality for all of us to think about.

From these two discussions on rather specific pork carcass evaluation, we thought it would be well to go to a little more general field and to review some of the recent work in pork, so that we will know in what areas various workers have concentrated their efforts, and also to discuss a little any new technics that we should be familiar with in order to do a better job of pork carcass evaluation.

For this part of the program we have asked Dick Alsmeyer, of Florida, to review recent research in pork. (Applause)

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RECENT PORK RESEARCH

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Pork carcass research was well covered in the 1953 Conference. Since that date, work has been published primarily on the effects of feeding on carcass characteristics and objective evaluations of carcass leanness. I would first like to cover the effects of feeding on carcass quality.

Bohman, Hunter and McCormick (6) and Kidwell and Hunter (20) reported that alfalfa, as 50 percent of the ration produced leaner carcasses with a higher cut-out value for lean cuts; this feeding regime, however, reduced dressing percentage. Feeding levels of 10 to 40 percent of alfalfa meal, Becker and coworkers (3) at Illinois also observed decreased dressing percentage.

Lately, there has been considerable interest in the effects of antibiotics on certain carcass characteristics. Kelly, Bray and Phillips (19) at Wisconsin reported an increase in backfat thickness as a result of aureomycin supplementation. Although Kline, Kastelic and Ashton (22) at Iowa noted an increase in backfat thickness and lower carcass specific gravity, carcass quality, as measured by length of body, thickness of backfat, specific gravity and percentage of lean cuts, was not appreciably affected by antibiotic feeding. Kropf and coworkers (23) at Wisconsin found that antibiotic feeding had no significant effect on dressing percentage or carcass length. Wallace and others (38) at Florida observed little effect of antibiotic feeding on physical carcass measurements. Clawson, Sheffy and Reid at Cornell (10), Ashton and coworkers (1) at Iowa and Hanson and other Minnesota workers failed to demonstrate any important effect of antibiotic feeding on carcass characteristics. It thus appears that if there are any effects of antibiotic feeding on carcass fatness, the magnitude of the effects are not great.

Other workers have studied the effect of adding fat to swine rations either to mask the effect of soft-pork producing feeds or as a feeding use for various surplus fats. In several experiments, Blumer and coworkers (5) using coconut oil as 10 percent of the ration, sufficiently hardened depot fat of soybean oil-fed pigs. Baird (2) working at Georgia, added 5 percent tallow to a swine ration and produced carcasses with a firmer fat than their controls.

In an attempt to produce leaner pork carcasses, several studies on the effects of high fiber rations were undertaken and are reported. In 1954, workers in Canada (13) and England (11) increased the fiber content of swine rations and thereby increased carcass leanness; however, Teague and Hanson (35) found no correlation between the level of fiber fed and carcass characteristics.

Recently, the effects of hormone treatment on pork carcass characteristics have been studied. Purdue workers (4, 37) administered diethylstilbestrol and methyl testosterone orally and anterior pituitary growth hormone intermuscularly to swine and reported that pigs orally receiving 20mg. of testosterone daily yielded carcasses with a higher percentage of lean cuts. Chemical analysis indicated that pigs receiving the testosterone had 5 percent less fat and 5 percent more lean. Growth hormone injected pigs had longer carcasses, less backfat, more protein and moisture than the control pigs. Bratzler and coworkers (8), however, found no significant differences in carcass characteristics when barrows were implanted with testosterone propionate.

Attempts have been made to regulate carcass composition and development by restricting nutrient intake. Merkel and coworkers (28) at Wisconsin produced carcasses with a slightly higher percentage of lean by limiting feed consumption. Similar results were obtained by Tribble and Pfander (36) of Missouri; Jordan, Beeson and Wiley (18) of Purdue; Lucas and Calder (27) of Great Britain; Wallace and others (38) at Florida and Crampton, Ashton and Lloyd (12) at McDonald College.

Other researchers have studied effects of level and quality of protein on carcass characteristics. Kropf and coworkers (23) in 1955 reported that a ration of 12 percent, low quality protein produced carcasses with a lower percentage of fat cuts and a higher percentage of picnic and Boston butt. Ashton and others (1) at Iowa, using levels of 10 to 20 percent protein, noted a tendency toward leaner carcasses with an increase in protein level. Tribble and Pfander (36) at Missouri observed a 1.6 percent increase in lean cuts and 4.6 percent less fat in carcasses of pigs fed a 16 percent protein ration compared with pigs fed a 12 percent ration. In 1955, Stevenson, Hiner and Ellis (34) obtained similar results using 14 and 16 percent protein rations.

Brady, Zobriskey and Mullins (7) studied the ratio of fat to lean in the ham of pigs at various weights. They observed striking increases in fat tissue and only slight increases in lean tissue of hams of pigs slaughtered at 100, 200 and 300 pounds compared with pigs killed weighing 50 pounds. In other work, Herbert and Crown (17) reported that gilt carcasses produced a higher percentage of ham and loin, larger loin areas and a higher percentage of separable lean in the ham than barrow carcasses. Lasley and Kline (25) noted that splitting and cutting errors may limit the reliability of estimates obtained by evaluation of one half of the carcass. They reported heavier ham, picnic, loin and Boston butt weights from the left half of the carcass and greater loin eye area at the 10th and last ribs for right loins.

Lately, many papers have been published on pork carcass evaluation techniques. Clawson, Sheffy and Reid (10) of Cornell found a high correlation between carcass specific gravity and carcass moisture using the antipyrine dilution method. They postulated that if the water content of the whole, empty body is known, the total composition of the body of swine may be accurately predicted. Based on correlations, Whiteman and Whatley (39) at Oklahoma stated that specific gravity, average backfat thickness and loin lean area are preferred measures of carcass evaluation. They later reported high correlations between carcass and ham specific gravities and that specific gravity was more closely associated with other measures of leanness than was

backfat thickness. These workers reported the following to be important in measuring specific gravity in water:

1. Water temperature is of no practical consequence if within a 20°F. range.

2. Weight in water must be read rapidly since specific gravity becomes less as the meat temperature increases.

3. The amount of exposed surface is not important.

4. Changes in water purity are important if it changes its density.

5. The longer the object is submerged, the less will be the density.

6. When weighing in water, weight to the nearest one hundredth of a pound is sufficient.

Price, Pearson and Benne (33) recently reported that specific gravity of the ham or carcass more nearly measures muscling per se than live probe or backfat thickness. Also, the loin lean area at the 10th rib more closely predicted carcass cut-out than area at the last rib. Pearson and coworkers (29) later reported that the single untrimmed ham, shoulder or loin can be used to estimate the specific gravity of the carcass, however, the ham is preferred due to the ease of handling. Specific gravity of either the carcass or the ham proved superior to backfat thickness as a measure of carcass leanness. The percentage of protein, moisture and ether extract of the ham was reported by Whiteman, Whatley and Hillier (40) to be highly correlated with specific gravity of the lean of the ham. Kline, Ashton and Kastelic (21) observed differences between specific gravity at time of slaughter, after 24, 48 and 72 hours of chilling. Therefore, changes in specific gravity during chilling indicates that carcasses must undergo a uniform chilling time. Liuzzo, Reineke and Pearson (26) have developed an air displacement method of determining specific gravity using two chambers. A highly significant correlation was noted between air displacement and water displacement techniques of determining specific gravity of guinea pigs.

In 1952, the live probe technique was developed and later the lean meter was perfected. In 1957, Pearson and coworkers (31) compared the lean meter and live probe methods on 99 hogs. They noted little difference between them in estimating backfat thickness or carcass cut-out; however, a higher correlation was reported for the live probe with specific gravity, both loin areas and fat trim. Zobriskey and others (42) at Missouri reported backfat measures to be the most accurate estimate of fat yield. The hip probe was the best indicator of carcass leanness. In 1956, Lasley, Hazel and Kline (24) observed a high correlation (0.88) between ham weight and the lean cuts. A squared multiple correlation coefficient of 0.91 for predicting lean cuts was reported for carcass weight, backfat, length, loin eye area and ham weight.

Recently, loin eye areas at the 10th and last ribs, lean are of the ham and fat to lean ratio of the untrimmed loin have been studied as related to carcass leanness. Cahill, Sutton and Kunkle (9) at Ohio State obtained

high correlations between area of Longisimus dorsi at the 10th rib and weight and percentage of primal cuts. However, in 1955, Fredeen, Bowman and Stothart (15) comparing several techniques of estimating carcass leanness, reported a high association of loin eye area at the last rib with percent lean of the ham. They found the percentage of lean in the proximal face of the ham a superior measure of carcass leanness to the loin eye area measure. In 1956, Pearson and coworkers (30) indicated the area of lean at the last rib to have a slightly higher correlation with cut-out than area at the 10th rib.

Although only moderate correlations were found between the fat to lean ratio of the rough loin and carcass cut-out, the fat to lean ratio could be useful if carcass cut-out is unavailable. In 1954, Bratzler and others (8) obtained a correlation of 0.86 between cut-out and area of the rough loin. Working on ham leanness, Fredeen, Bowman and Stothart (14) used the percent lean of the open face of the ham, physical separation and specific gravity of the ham to obtain a reliable estimate of ham leanness. The percent lean in ham face was the most accurate with a predictability of 64 percent. Jordan, Beeson and Wiley (18) using chemical analysis as a criteria, reported the percent of lean cuts to be a more accurate estimate of carcass leanness than average backfat thickness.

In summary, it has been shown that an increase in ration fiber, limited feeding, increased protein levels and testosterone given orally and anterior pituitary growth hormone injected intermuscularly, tend to increase carcass leanness. The inclusion of coconut oil and tallow in rations produces a firmer fat. Differences in weights of cuts and areas of the loin eye have been noted between halves of carcasses.

The more promising and reliable techniques of carcass evaluation are: specific gravity of the carcass or certain cuts, the antipyrine dilution method of estimating carcass moisture, air displacement specific gravity, the live probe and lean meter for backfat thickness and the lean area of the loin at the 10th and last ribs.

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DR. STRONG: Thank you, Dick. We appreciate your efforts in bringing together into one spot these results of recent research and the good list of references accompanying your paper.

I would probably be the last one in the room to tell embarrassing stories on the next speaker. (Laughter) We are not exactly ahead of schedule; so to take time to extol his virtues, might not be popular. So let's just consider grading as an evaluation tool.

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GRADING AS AN EVALUATION TOOL

C. L. STRONG

UNITED STATES DEPARTMENT OF AGRICULTURE

In the evaluation and comparison of pork carcasses, we employ a variety of tools to aid us in accomplishing our objectives. Some of the tools are relatively simple, well-known, and easy to apply with a minimum of labor, time, and equipment. Others are somewhat more complex, utilizing unique methods and special equipment designed for a particular purpose and requiring many hours of detailed work. We are interested in a number of characteristics in appraising differences in pork carcasses, and selection of the procedure to use depends on the factor that is to be measured. It is necessary to examine the nature of a particular tool in considering its usefulness for a desired purpose.

The Federal standards for grades of pork carcasses were designed as a practical aid in marketing. One of the basic principles in developing grades for slaughter animals and meat is to provide a means to help reflect consumer demand for meat to the livestock producer. Preferences in pork are concerned with the palatability as influenced by various quality factors, and with quantitative aspects, with increasing emphasis on proportions of lean and fat. Differences in these important characteristics form the basis for the standards for grades. The contribution that grading offers as an evaluation tool is the identification of differences in these factors.

Quality identification provided by grading primarily follows the pattern followed in the merchandising of pork. The primary aim is separate identity of pork with generally acceptable or unacceptable palatability. Carcasses expected to produce cuts with acceptable palatability exhibit a rather wide range of quality characteristics. The standards provide for two categories of lower quality. This approach is based on the observation that most consumers seem to be less discriminating of quality differences in pork than in other meats. The reasons frequently advanced for this condition include the relative youthfulness of most swine when slaughtered, the high proportion of pork subjected to processing, and perhaps the dwarfing influence of a pronounced preference for lean rather than fat pork. From an evaluation standpoint, the standards accomplish quality designation on a rather practical scale. Precise identification of fine differences in quality must be made through other evaluation procedures.

The identification of quantitative differences among pork carcasses made possible by grading is due to the relationships that have been established between measurements and yields of lean and fat cuts. The practical nature of grades again is evident in at least two respects. In the first place, the standards are based on yield of major lean cuts--a rather practical measure of lean and fat proportions of carcasses. In addition, each of the five grades includes carcasses with expected lean cut yields within a specified range. Thus grading accomplishes a grouping of carcasses similar in lean cut yields but different from those in another group or grade.

Outlining the nature of grades leads to some of the advantages of grading as an evaluation tool. Grades provide a practical means of measuring differences that are important in marketing. A practical link of this kind is often necessary to obtain application of research results. In addition, grades for carcasses correspond to those for live animals and provide a key to relating carcass and live animal characteristics. The application of the results of comparisons of carcasses often depends upon expression of the differences in terms of live animals.

A feature of grading increasing its usefulness in evaluation is the expression of differences in familiar terms of uniform meaning. This encourages the use of results by some who would be unlikely to attempt interpreting and applying the results of more technical procedures. Grading also may be rather simply and easily accomplished with a minimum of time and equipment compared to some evaluation methods.

Recognition of some of the limitations of grading is a part of any examination of the usefulness of this evaluation tool. In this connection, one of the most important considerations is the fact that more precise methods are available for judging both qualitative and quantitative characteristics of pork. We may employ objective means of measuring firmness, marbling, texture, color, and other quality factors. Taste panel evaluation of tenderness, juiciness, and flavor moves another step nearer the desired goal of measuring differences in palatability. Estimating yields of cuts by measurements or other means on the basis of individual carcasses is more precise than the grouping accomplished by grading. Performing cutting tests eliminates the error inherent in estimating yields. Yields of separable lean, fat, and bone give a more accurate reflection of lean and fat proportions than do yields of cuts. The objective of the evaluation and the use to be made of the results must be considered in selecting the methods to employ.

In keeping with the theme of improving pork carcass evaluation, let us consider means by which the standards might be made a more precise evaluation tool. An important objective of most evaluations, and of grading, is the reflection of consumer demand to the livestock producer. A complete schedule of related standards for grades of cuts, carcasses, and live animals would aid in accomplishing this objective. Those of us with the responsibility for developing standards have long recognized the logic of this approach, but circumstances have prevented adopting it. However, interest in grade designations in merchandising pork cuts apparently is increasing, and we feel that such grades must be developed in the near future.

The objective measurement of pork quality through determination of the effects of various factors on palatability is a basic prerequisite to the development of standards for grades of pork cuts. This involves detailed laboratory analyses of the physical, chemical, and histological properties of pork and their effects on palatability. In addition, the relationships of quality characteristics and lean and fat proportions in cuts, carcasses, and live hogs should be determined in order that a specific grade may reflect the same range of quality and quantitative proportions throughout.

The data analyzed in developing the present standards for grades of carcasses show that average backfat thickness in relation to weight or length

explains about 70 percent of the variation in yields of lean cuts among carcasses. Consideration of additional measurements may allow more reliable estimates of yields. For example, thickness of muscling varies considerably among carcasses of a particular grade. A practical method of measuring this factor might be used to improve the standards. It is also possible that a lean to fat index may be developed that is a more precise measure of carcass merit than yield of the four lean cuts.

Improving the correlation of grades of hogs with corresponding grades of carcasses and cuts can be accomplished by identifying and evaluating the relative importance of the characteristics of hogs associated with variations in lean and fat proportions in carcasses and cuts. Present standards for grades of hogs are subjective in nature, but some techniques for objectively measuring such factors might be incorporated into the standards. A systematic program leading to closely related standards for grades of cuts, carcasses, and hogs could result in more accurate and meaningful evaluation through the use of grades, either in research or in marketing.

Grades are rather commonly used by many as a convenient means of determining price or value differences. Although grades are designed primarily for other purposes, they identify differences in some of the value determining factors, and price often shows a relationship with grade. Consideration of grade along with other factors allows a reasonably accurate estimate of value.

Estimation of value differences between grades of pork carcasses and hogs is possible due to differences in yields of lean cuts and fat cuts indicated by grade and differences in market prices of the various cuts. For nearly two years we have made a biweekly computation of the cut-out value difference between U. S. No. 1 and U. S. No. 3 grade 200 to 220 pound barrows and gilts. This information is transmitted to livestock market news offices throughout the country. Our interest is in the value differential between grades rather than in the general value level. It is useful background information for market reporters, for it shows the net effect of changes in prices of pork cuts on live hog values. Many persons connected with market agencies, packers, and other organizations have shown interest in the value differential, and it is now published in some market reports.

The computation of a value difference between grades is accomplished by use of representative cutting yields for each grade and wholesale prices of the various cuts. In converting the figure to a liveweight basis, the dressing percentages used are 69 percent for the No. 1 grade and 70 percent for No. 3. It should be recognized that the value differential represents averages in many respects, and that some items of difference between grades are not considered due to lack of price or yield information or to simplify the computation. For example, the cutting yields and dressing yields are considered representative for the grades, but individuals or groups vary in these characteristics within each grade. The price for a cut is the same for both grades, although weights of cuts are slightly different by grade and affect the prices of some cuts.

Differences in value of edible and inedible products and by-products are not included in the computation due to lack of information on yields and prices. In spite of these sources of error in the value differential, a packer

recently reported regularly obtaining almost the same differential on the basis of a considerably more detailed computation.

The computed value differential between the No. 1 and No. 3 grades since August, 1955 has varied from 65 cents to $1.08 per hundredweight, live basis. It has been within the range of 70 to 89 cents about 71 percent of the time, 90 to 99 cents nearly 15 percent of the time, and over $1 or under 70 cents nearly 15 percent of the time. The higher differentials have occurred during June, July, and August and the lower differentials during November and December. This seasonal pattern suggests that the level of prices affects the differential to some extent. However, a more important factor affecting the value differential between grades is the difference between prices of lard and the major lean cuts.

A question frequently raised concerns the amount of value differential, accurately reflected in hog prices, that is necessary to encourage the production of meatier hogs. Many advocates of meat-type hogs maintain that price differentials of 40 to 50 cents per hundredweight do not provide sufficient incentive to producers. In this connection, it is well to consider the effects of differential prices for cuts on value differences. If the loins from No. 1 grade hogs were priced 5 cents per pound higher than those from No. 3 grade hogs, the value differential between grades would be increased about 50 cents per hundredweight. A similar 5 cents per pound difference in ham prices would increase the value difference more than 65 cents. Thus the possibilities for increased price incentives through differential prices for cuts obviously are rather good.

In conclusion, grading represents one of the practical evaluation procedures that is of particular value for comparing pork carcasses from the standpoint of commercially important differences in quality and yields of cuts. General familiarity with grade terms and their meaning encourages the widespread application of research results. Grading may be combined with more objective and precise methods of measuring differences in pork carcasses as dictated by the purpose and scope of the evaluation. In addition, grade standards may be improved to make them a more effective and reliable tool to aid in the evaluation of cuts, carcasses, and hogs for both research and marketing purposes.

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DR. STRONG: Now, to add his comments and to let those of you who wish add your own comments or present your questions, we will ask Bill Cole to lead the discussion.

DR. COLE: I thought that we had a good discussion from Mr. Pearson on muscling, and I personally feel that this is a very important part of pork evaluation. I am also of that school that feels that dressing per cent is still determined quite a bit by fat and length; that is, the fatter and shorter ones will dress a little higher than the longer ones, but that not necessarily need be. I think that if we can breed these hogs with more muscle in there instead of fat possibly that dressing

percentage that was mentioned in Mr. Strong's paper for the No. 3 hogs having the slight advantage can be erased somewhat with an increase in the muscling. So we have a long way to go in that respect.

In Mr. Briskey's paper on quality I think he did an excellent job, a little lengthy but a very good job on a very difficult subject. I think there that some times we forget about quality; that we are interested in producing a lot of meat and we forget that we want some eating quality along with the quantity. He certainly pointed out that it is not a pitfall that we want to fall into, and that we are still interested in some eating quality.

Then Mr. Alsmeyer's paper on research -- by the way, if you didn't realize it, that was a review of research since 1953 only, covering 42 papers. Personally I feel that it will be a very fine addition for reference for our future pork work.

Then I thought that Lowell gave a really fair estimate of the usefulness and the limits of the U. S. D. A. grades. He did not mention a thing about price incentives. I know you have all heard the story. You work pretty hard and you put on a type demonstration, and then the group say, "Well, we would like to produce that meat type hog, but when are the packers going to pay more money for it?" I feel that we are on a plateau and that possibly the answer is that we are going to have to go ahead without a price incentive if we are going to stay in the pork business. There is no reason we should not because this meat type hog can be produced as economically. They are good in the farrowing house, they are good on the feed lot, and certainly they are good in the carcass, so that we do have a type of hog in America today. In America I believe the hog people are a little ahead of the beef and the lamb people in that respect, and that is they are on the right track with their certified meat leaders and other type programs that they are carrying on.

Those are all the comments I have, and I would entertain discussion from the floor.

MR. RUST: We have been talking here for the last hour or so in terms I think several of us are just a little confused and that is quality. Will somebody kindly define it, and if we cannot define it I don't see how we can evaluate it and reevaluate it or anything else.

DR. COLE: I don't want to tackle it myself. I thought that Mr. Briskey sort of outlined what he was trying to put across as quality. Ernest, do you want to answer that question?

MR. BRISKEY: I think I answered it and I will repeat the statement: My statement was that it has not been defined, and until we know something about contributing factors, whether we term it eating satisfaction, appearance, or what have you, I don't think we can define it. I think that Dr. Kastelic defined it quite well in 1953, and I think at this point we would still have to define it that way.

MR. DEANS: This has no relation to this question. I was quite interested, Ernie, in your slides on those ham sections. I am curious as to whether you attempted or were able to demonstrate the carry-through of these indefinable things in the cured smoked product. Have you done any work on that?

MR. BRISKEY: We studied this at Ohio a year ago and found it to be true, and recently we finished an experiment where we followed through the groupings in fresh and cured form, and we found that they showed off just as markedly in the cured form as they did in the fresh form.

DR. BRATZLER: Where did you get your two-toned hams, Ernest? Did you pick them out or go to a certain breed or what? I think perhaps at least I would be interested.

MR. BRISKEY: These animals were purebred hogs selected from southern Wisconsin, many breeders, and they were one breed. They were used in experiments. They were one breed, similar weight range, and totaled that way.

DR. J. L. HALL (Kansas State College): These comments that Ernie has made regarding this two-tone ham I think points out a situation that perhaps is not as readily recognized as it might be; that is, the condition that we have in so-called dark cutting beef is not confined to beef. We have almost identically the same condition in pork, and this change in color that is described as a difference in penetration of light is simply due to the lack of oxygen in this high pH. sector which prevents the penetration of oxygen to the meat, so that the myoglobin is in a reduced state which is a very much darker color than the bright oxygenated condition. That is the same as you find in dark beef.

That was brought out very clearly by the experiments done by Calloway, in Ireland, some six, eight or ten years ago, and I wrote to him at the time and asked him for more detailed information with regard to the conditions there, mentioning the fact that it seemed to be similar to the results that had been found in this country with regard to dark cutting beef. He verified my observation about it and he said that it seemed to be almost exactly the same condition and was apparently brought about by the same cause, largely due to shipping.

DR. COLE: The Chairman says that I am supposed to quit. What about it? I will let him take over, and if he permits more questions that is fine.

CHAIRMAN BLUMER: I am very sorry to have to cut you off, but if we are going to get to the banquet tonight at six o'clock, it would appear that it might be necessary.

Lowell, we are very grateful to you and your committee for all the fine work you did in preparing these talks.

There are a few announcements that I should like to make before the recess.

(Announcements followed by a recess.)

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CHAIRMAN BLUMER: Now we will go right on with the job of electing our conference chairman for next year, and I will turn the floor over to Jerry Wanderstock.

DR. WANDERSTOCK: We are about to elect a conference chairman, and I have listed on the board the members of the Executive Committee: Adams, Cahill, Deans, King, and Naumann, and being distributed to you I hope are some ballots. Now let's vote for just one of these people. We do not necessarily have to vote for one of the members of the Executive Committee who has been retained from last year and so I have listed them alphabetically. For the sake of the information, though, maybe you might want to know that Cahill and King are the two who are serving on the current Executive Committee. But remember that we can vote for any one of the five as chairman of the Executive Committee. So put just one name down. If we run into a close situation, we will have to have another vote and we will eliminate the poorer runners.

(Balloting.)

CHAIRMAN BLUMER: We will go on then with our program. The Chairman of the Teaching Committee is H. D. Naumann, of the University of Missouri. Don, will you assume the Chair, please?

MR. NAUMANN: I won't say anything and take up our time.

The first speaker on this program is Professor K. F. Warner, of the University of Maryland, who is going to share some thoughts with us on communicative skills in teaching. (Applause)

PROFESSOR K. F. WARNER: Thanks, Don.

Good morning!

This is going to be a change of pace. The Teaching Committee should be a change of pace and I hope it comes at a time when you welcome a change of pace.

Communication is a most important area, and I hope we can reverse the deal or change it so as to give a good example of what we are talking about.

I was thinking this morning that the first one of these conferences that I attended was in 1924, at the Fontenelle hotel, in Omaha, Nebraska. It was the first cooperative meat conference held. This organization was just a gleam in Pollock's eye in those days. F. B. Mumford, P. F. Towbridge, Howard Gramley, Paul Howe, E. W. Sheets were the first ones. I have been to a good many since, and I wanted to express my appreciation for still being able to attend one.

I would be out of this if it were not for your generosity with my change of ties, your generosity, your friendliness, and I appreciate the fact that you have included me.

You know that in my work through the years as an Extension meats specialist I had two jobs. One was selecting the information to teach and the other was packing it so it could be passed on to others. What to teach and how to teach - two jobs. Every specialist has two jobs: What to teach and how to teach. I discovered that increasingly I became interested in how to teach -- more interested -- and along about five or six years ago my suitcase commenced to wear out and I had the problem of knowing whether I should buy a new one. I also discovered that I was getting behind in my subject-matter, that you boys were going too fast; that as an Extension meats specialist I was no longer a specialist, I was getting a little behind, and it became my job to know what to do.

So I concentrated on training. I didn't have to catch up with you all. I didn't have to buy a new suitcase. It has been a most pleasant assignment. I have enjoyed it. And my new assignment since I retired from the Department, at the University of Maryland they decided that they were going to do what they had wanted to do for a long while: Put more emphasis on the in-service and graduate training opportunities for Extension workers, and so they asked me to come over and see if I could give them a lift on that.

Imagine, it is just a mile from home to the University of Maryland! The folks I work with are my neighbors. It is a family operation. There is only one hazard. I have been preaching for some 75 years. Now I have to see whether I can practice what I have been preaching. I hope I will come out all right.

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COMMUNICATIVE SKILLS IN TEACHING

K. F. WARNER
UNIVERSITY OF MARYLAND

Communication is a complicated process. It is complicated further by the fact that two or more people must always be involved.

There is the sender who creates the message, codes it and transmits it. The receiver, receives the message, decodes it and interprets it against the background of his experience. This process provides many opportunities for mistakes. For example:

I wish to transmit the fact that communication is a continuous process. So I code the message in selected words, "Communications is a continuous process." I write my message and give it to the group.

The chap sitting on your right used to be in the newspaper business. He receives my message and decodes it against his background of experience. To him communications means newspapers, magazines, radio, all types of mass communications. When he reads my message, "Communications is a continuous process," his response is, "It sure is. The presses are running and the radio is banging at all hours."

The communications that I referred to in my message, of course, were the individual ones that you and I keep sending. The fellow on your left understood that. He'd had a course in leading a discussion. He had learned the importance of letting the other fellow talk. When he read my message, "Communications is a continuous process," he sort of grinned and mumbled, "Almost continuous anyway. We spend a lot of time talking when we should be listening."

You see, my message, "Communications is a continuous process," is really unclear, incomplete. My idea, the one that I tried to transmit was that you and I and every one are communicating all the time; that talking or silent, smiling or frowning, alert or dozing, we are sending messages.

I coded my idea into, "Communications is a continuous process," and sent it out. The folks decoded it against the background of their experience. I got back, "The presses are running and the radio is banging at all hours," and, "We spend a lot of time talking when we should be listening." Those are the surprise meanings given to my incomplete message. That is what two people think I said. Disconcerting, isn't it? No wonder we have delays, mistakes, confusion, arguments and hostility. Misunderstandings are so easy and can be so great.

Communications are essential, of course; they are a part of everything we do. By and large we code and decode to good purpose. But there is a real opportunity to do a better, more effective, job.

We who would communicate have five decisions to make. We must decide upon the audience, the message, the channel, the appeal, and the treatment. Let's consider those decisions separately.

First, to whom is this communication going? Who is the intended audience? Is the audience a student, a class of students, a group of farmers, a mass of consumers, your supervisor, your colleague, your wife, your children, or perhaps a traffic cop? Who's the audience? With whom do you wish to communicate?

Second, what is your message? What do you want this selected audience to know or feel or do? For example, do you want your class to know what are the best temperatures for freezing and storing meat? Do you want them to feel that wrong storage temperatures and the resulting lower quality meat are really a slap in the face of the livestock industry? Do you want them to know how to set and read a thermo-couple that will record temperature changes. What is your message?

Third, what channel of communications will you select? Will you transmit your message by talking, by writing, by showing? Will you make up a combination? What channel or channels will you use?

People learn best when they have a strong desire to learn. You hope your students want to understand all the various relationships between meat and temperature. So-

Fourth, what appeal will you use to earn their interest? Will it be a desire to please you or a fear of failure and flunking? Will you visualize proper storage as a source of future profit to them or as information that they will enjoy passing on for the benefit of the whole livestock and meat industry? Do you help your students to see themselves as salesmen of quality home freezers, as successful superintendents of meat processing plants, as family men who like to surprise guests with out-of-season venison? What appeal will you use to motivate them to learn and do? How will you "get under their skin"?

Now that you have selected your audience, determined your message, chosen the channel, and picked the appeal that you believe will gain their interest, it remains only to code your message for transmission.

Fifth, what "treatment" will you give this idea? What words, illustrations, actions, will you put together? Will you pour it on or have others help you paint the picture? How will you present your message? What "treatment" will you give it?

Breaking down the communications process into these five parts is easier than reassembling them into an effective whole. Depending on our skill in fitting them together, we have understanding or confusion, action rather than delay, friendliness instead of hostility.

Communications is part of everything we do. Effective communications makes the job easier, happier, more useful.

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DR. NAUMANN: Thank you, Professor Warner.

The next talk will be by Auttis Mullins who was assisted in preparing the manuscript by Steve Zobrisky who cannot be here due to a real crisis. At this time Mr. Mullins will present the topic, "Teaching a Basic Meats Course Entirely by Demonstrations."

MR. MULLINS: As Don indicated, Steve and I were given the assignment of presenting this in the way that we present the basic meats course in Missouri. Steve was very gracious and consented for me to fulfill the assignment and, as Don indicated, he cannot be here today.

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TEACHING A BASIC MEATS COURSE

By

DEMONSTRATION TECHNIQUES - A. M. MULLINS

UNIVERSITY OF MISSOURI

I find myself in a very awkward situation. In the first place I am following a very noted person, Mr. Ken Warner on the program, who is an authority on teaching methods, and secondly, I am talking to a group of very competent teachers with much more experience in the teaching profession than I have had. However, I would like to present to you our method of teaching a basic meats course at Missouri. Later, we would welcome any comments or questions in the way of constructive criticism or otherwise that any of you might have.

First, I would like to give you an idea of the amount of class hours involved in our basic course and the objectives we have outlined. Our basic meat classes meet 3-2 hour periods per week. These periods are arranged for either a laboratory period or a lecture period. However, in the past it has evolved around one lecture period and two laboratory periods. Our objectives in the course are to familiarize the student with the livestock and meat industry relationships, i.e. live animal carcass comparison, slaughtering, cutting, curing and smoking, identification, selection, processing, distribution, utilization of meat and meat products.

As more and more subject material became available in these areas, we found we did not have time to present the students with the subject matter and still do the amount of slaughtering and processing that had been done in the past. When we analyzed the situation we came to the conclusion that slaughtering and processing were not what the student should be doing in the course as very few if any of the students would ever need to have this type of experience. We did make it possible, however, for any student who was interested particularly in this type of work to gain some experience by working in the meat laboratory.

We arranged our teaching program around a demonstrational type of presentation. We also canvassed the meat industry for visual aid materials to support this method of presentation. We found to our surprise over thirty color and sound films which were applicable to the subject matter we wanted to present. The Meat Board was very helpful in this venture and supplied us with several films and suggestions concerning other films.

Our course has been taught for two semesters by the procedure which I shall outline to you, and we have had the occasion to see some of these students in our advanced meat class, as well as, get their reactions to the way the course is being taught. I shall relate some of their comments to you later.

I shall present to you an outline of the subject matter and manner or presentation which we follow in our basic meats course.

We usually spend the laboratory periods of the first week introducing the student to the laboratory facilities and issuing equipment. Knives are also sharpened during this week. However, the students are not required to purchase any of the knives, but most of them buy a boning knife. An introductory film entitled "Miracle of Feeding America" is shown the first week which is a very good introduction to the relationships of the various aspects of the meat industry.

The first subject matter presented is principles on refrigeration, packaging and sanitation. Another film, "The Story of Packaging" which gives an animated description of the role of packaging is used during the lecture on packaging. Refrigeration diagrams and a demonstration of cleaning and sanitizing procedures are also presented during the lectures on cleaning, sanitation and refrigeration.

The student is introduced to Agricultural Statistics with special reference to livestock production and consumption. Pictorial graphs are available for depicting the geographical areas of major production and major consumption with respect to different species.

At the second half of the lecture period during the third week the students are introduced to live animal evaluation by actually participating in a live animal evaluation exercise. Animals are evaluated similarily to the methods used in the live animal evaluation clinics. These animals are slaughtered the following week with a demonstration slaughter by the instructor. The film "Leaner Hogs and Longer Profits" is used when pork is to be evaluated as it depicts some of the aspects of producing the right kind of hogs and what to look for in meat type hogs. Following the demonstration on pork slaughter, there is a cutting test demonstration (wholesale-cuts only). The students are asked to do the calculations on the cutting sheets and hand them in the next class period.

Composition and structure of meat is discussed in a lecture period and the film entitled "There's Gold in Meat" is shown later to crystallize some of the major points of discussion and introduces the student to merchandising and cooking of meat. The following week lard manufacturing and curing are presented by lecturing during the laboratory periods and by demonstrating in the laboratory the techniques involved. Meat inspection is discussed rather thoroughly and usually a visiting lecturer (Veterinarian) presents this lecture. The film "Meat with Approval" is shown after this lecture which shows the purpose of meat inspection and the steps of inspection from live animals through to the finished product. This film is old but does a very nice job of conveying the message on meat inspection.

The following week is spent on pork merchandising, i.e. cutting into various retail cuts and identification of all the various cuts. The laboratory technician and student labor slaughter the animals required for this demonstration. Both fresh and cured products are utilized in these merchandising demonstrations. Another film "Pork Round the Clock" aids in telling the merchandising story on pork. The class also visits a local slaughtering, wholesale and retail establishment during a laboratory period to culminate their concept on pork slaughter, processing and merchandising. At this point

the student gets some real experience in student participation in the form of an examination over the material which has been presented. An identification test over all cuts of pork is also given at this time.

Meat grading is discussed at some length with special reference to each of the three species. Color slides are used in this presentation to illustrate various grade characteristics. Carcasses are also used in grading exercises when available. The student always gets to see the carcasses and cuts from the live animals which they have previously evaluated.

The students again evaluate another class of livestock of a different species and these animals are slaughtered the following week in another demonstration slaughter. The students are permitted to participate in the demonstration slaughter at times but it is done primarily by the instructor with narration as it is being done. The film "Can-Pack System of Dressing Beef" is shown after the beef slaughtering demonstration which enlightens the student on the most modern ways of dressing beef.

One lecture period is devoted to discussing the nutritive value of meat and we expound on some of the fads and fancies of people concerning meat and meat products. Two or three good films are available for use here: "The Way to a Man's Heart", or "Three to Get Ready" are both applicable and tell a colorful story of the nation's meat industry and the recent findings on the nutritive value of meat and its place in the balanced diet.

A demonstration beef cutting test is performed similar to the pork cutting test with the students having an assignment on the cutting test. The carcasses are broken down into the wholesale cuts during the first cutting test and later are merchandized into the various retail cuts from which another cutting test is performed. Considerable time is spent in discussing beef merchandising and identification, selection, etc. of the various beef cuts. One carcass is completely boned and fabricated into the various portion-sized and formed cuts commonly seen in frozen meats. Cutting tests are performed on this demonstration also. Another film entitled "Thanks to Beef" is used to document the merchandising aspects of beef.

Livestock conservation is discussed rather extensively with the use of placard or posters and a very good film entitled "An Ounce of Prevention" which emphasizes proper care of livestock on farms and in transit as well as at the slaughter station.

Meat deterioration is also discussed both from a pathogenic and non-pathogenic viewpoint with special reference to food poisoning caused by bacteria.

Meat preservation other than curing is also discussed, i.e., canning, freezing, dehydration, etc., but at present we have not found suitable visual aid material to support our material on these subjects.

Meat cookery is discussed throughout the course in the discussion on selection and use of various cuts but a lecture period is devoted to the detailed explanation on cookery. A cooking demonstration is given during a laboratory period using various methods of cookery. At the same time a carving

demonstration is performed on the various cuts with the student participating by eating the product. Films entitled "ABC of Meat Cookery and Carving" and "Over the Backyard Grill" are used to document these demonstrations. We find this demonstration is a good morale builder among the students.

By-products of the meat industry are discussed in some detail with the use of several dozens of samples of the various finished materials made from by-products. Also a very good film entitled "By-Products" is used to support this lecture. Another film entitled, "Leather in Your Life" also tells an interesting story of by-products utilization.

Lamb is handled in the same general pattern as the other two species i.e., evaluation of live animals, demonstration slaughter, evaluation of carcasses, demonstration cutting test, merchandising of various cuts and identification of all the cuts. A film entitled "It's Lamb Time" is used in the discussion on lamb merchandising and utilization. There are other films which I have not mentioned that we use whenever appropriate to document or support the material being presented. We have used as many as 25 films in one semester.

The students are given reading assignments in the text. (The Meat We Eat - Zeigler) throughout the semester as well as additional assignment in other texts and periodicals. Unannounced quizzes are given occasionally over material assigned. Three examinations are given during the semester which overlap the previous material and a final examination is given over all the material during the semester. Identification tests are given on each species as well as an identification examination over all species at the close of the semester. Student participation may merit approximately 1000 points per semester.

A one day field trip is arranged near the close of each semester in which the student is offered the opportunity to view a major meat packing plant and the various operations performed throughout the plant. With the subject material in the background the student is much more capable of visualizing and understanding the overall operation and functions of the meat industry. A general session during the tour enables the students to ask questions concerning what they have seen. In addition the students have the priviledge of discussing opportunities available in the meat industry with supervising personnel.

And now a summary of the comments which were handed in at the close of the semester.

The majority of the students indicated they would have liked more participation in the laboratory. One criticism expressed by many students was that material was too extensive and presented too fast. Another criticism was that too much statistics were presented. Some indicated the exams were too rough and that the course should be worth more credit hours for the amount of work done.

It was generally agreed that the laboratory work was very worth while and the visual aid materials were appreciated by most students. However, some students criticized the lectures in lacking organization and not being related to work done in the laboratory.

Our observations are that the students want to use their hands in this type of course but want to do very little outside work. This of course is not very conducive to creative thinking.

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DR. NAUMANN: Thank you, Mr. Mullins.

I imagine that we will have some discussion prompted by these two talks. Professor Mackintosh will lead this discussion, and he probably will take the prerogative, having the floor, of making a few comments, too, if I know him.

DR. MACKINTOSH: Gentlemen: - We have just listened to the presentation of two remarkably well prepared papers. One from a tried veteran in the field of education and the second from a relative neophyte. I am sure that if we were really listening, and all the evidence indicated that we were, there were numerous items in both papers that each one of us can carry home with us and if we put them into practice we will improve our teaching.

It is my feeling that teaching becomes more difficult each year. More difficult, because of the increasing volume of technical information that all of us seem to feel is essential in our respective courses and more difficult due to an increasing indifference on the part of the students, or perhaps it is an idea on the part of the student that he should be "spoon fed". Be that as it may, it behooves all of us, who try to teach, to spend more time and thought on the phases of preparation and presentation of our subject matter, if we expect or hope to have an influence on our students.

Our good friend Kenneth Warner has philosophized and theorized in the preparation of his paper. I use these words advisedly as a philosopher is one who meets or regards all vicissitudes calmly, one who searches into the reason and nature of things, and philosophy is practical wisdom. On the other hand, to theorize is to speculate or to analyze a give set of factors in their ideal relation to one another. I am sure that you will agree with me when I say that that is just what Mr. Warner has done in his presentation of "Communicative Skills in Teaching. Let us all be sure that we at least try to make our presentation clear to ourselves and at the same time clear to all the members of our class. I am sure that all of us have some difficulty in so doing.

The paper by Mr. Mullins was related to a particular type of presentation and as that type of presentation is practiced at the University of Missouri. I am sure that Mr. Mullins need offer no apology for his position on the program nor his presentation of his subject matter. It is my opinion that the course work as described by Mr. Mullins is a little different from that at many of our institutions.

It too may offer a challenge to many of us. The size of the class may be a factor not mentioned in his discussion, but where the number in the class will permit I personally would favor more actual participation by each member in the class. I agree that it is not our function to train meat cutters, but actual participation is the only manner in which most of our students will acquire a good knowledge of the where, why and how cuts of meat should be made.

The many visual aids, particularly "MOVIES" that are available today can be a great help, but one which I personally feel can be easily overdone. I do feel that the selection of these instruments of teaching have been well chosen and well placed in the course work as outlined by Mr. Mullin, but I fear that movies will not replace actual participation by the student. The student comments on the course are quite typical of those we receive at Kansas State where we do much more laboratory work, probably too much for a course carrying college credit. It seems to me that we should find a sort of happy medium and that will differ at each institution.

When exams are considered too rough and the students answers dissappointing, it should be a challenge to the instructor to give more thought to his means of communication as described in Mr. Warner's paper. These are just some of the items that I noted as I tried to study these two papers prior to the conference. I have one other suggestion to make and that is that Mr. Mullin should prepare a complete list of all the movies available together with their availability and add this list as a sort of appendix to his paper to be published in the conference report.

Now I should like to invite comments from the floor, even if it is late, because I think that we are very lax about our discussions when it comes to teaching, and, after all, that is one of the tasks for which we are supposed to be prepared. I some times think that too many of us try to spend too much time in research and not enough in teaching. Some of us possibly should never do any research; some of us maybe should do no teaching. (Laughter)

I should like to hear from someone on the floor. I am sure that all of you, with your experience, should have something to say.

MR. MULLINS: As I said earlier, we very much appreciate criticism.

By way of explanation of a few things that Professor Mackintosh has said, he and Professor Warner caused me to change part of my talk. That was the introductory paragraph. I was being apologetic perhaps, but I meant it to be humble to men like Mackintosh and Warner.

Now by way of explanation of the observations that Professor Mackintosh made, while at Missouri this semester I happened to have the opportunity to teach a class of veterinary students and this is what he observed: The class contained 29 students, 28 boys and one girl. Our normal number in meats is 104. Our beginning class is 45 to 55. We do

divide the laboratory into a maximum of 16. The lectures are given to one group. A lot of time the demonstrations are given in one group, depending upon what we are demonstrating. The movies are shown to one group, etc.

However, back to the class that we were teaching this time. I believe that Professor Mackintosh would have been amazed if he had been back at Missouri when that class of veterinary students cut lamb the next time they came to class. They did an exceptionally good job. We taught them differently in that they actually participated in doing what they saw in the previous laboratory.

The difference between those students and our beginning students is that they are a little more advanced or they are more mature, and I must say that they study more. Incidentally the class average was 86. The high was 96 and the low was 80.

So that is a little further explanation as to the type of course, the number of students, etc.

Thank you.

DR. MACKINTOSH: Are there other comments?

MR. RUST: I should just like to make the comment that in Extension work -- and I know that all the Extension people here will agree with me -- the packing of your information is one of the very important considerations in getting it across to the public particularly since you don't have a captive audience as you have in your classes. They can get up and walk out any time they feel like it.

I have found it quite helpful in my work to spend considerable time with some of the visual aids people on our campus. We have quite an extensive visual aids setup, and I know that a lot of other campuses have visual aids specialists in various departments, probably attached to the educational department.

I certainly should like to recommend that anybody who can, avail himself of the services of a trained visual aids specialist, and he can get a lot of benefit from it.

I know that characteristically we think of visual aids in terms of slides and films. But many other types of visual aids are available in terms of cards, markups, vinyl graphs, and so on. I think that to avail yourself of those facilities is a very worthwhile expenditure of time, because it makes your presentation so much clearer and certainly a lot more effective. At least I have found it that way.

DR. MACKINTOSH: There is no question there are many aids available to all of us if we will procure them and make use of them.

I don't know whether Mr. Mullins, in giving us those figures on the grades was bragging about how smart his class was or how easy he grades.

We have time for one more question if someone has one.

MR. HEDRICK: I am the one who taught the advanced meat course that Auttis made reference to. Approximately half the students had the beginning course, as Auttis outlined. The other half had the old method of instruction, giving the students more opportunity to participate. From my observations I would not suggest discontinuance of the method that Auttis has presented.

DR. ZIEGLER: I want to interject here something that has come into great use at Penn State in the line of getting students interested in their course work. That is, I keep track of the boys who are particularly adept at certain phases of the work. For instance, as we get boys who have had some practical experience in slaughtering, just to take the slaughtering end of it. I can tell the first two or three times I have them in class. I find out their backgrounds, in private talks with them. So what I do is make the man plant foreman. He has charge of the particular section under my direction. Others catch on and work toward that end, and the first thing you know I have my crew divided into three or four parts.

It was brought to my attention some years ago when we had a girl student -- quite a few girls take slaughtering, believe it or not. She was a good student and she was not afraid to get her hands dirty or to do anything in the line of slaughtering that any of the boys did. She was not averse to blood, and you did not have to hold her up because she was fainting. So I put her on as the forewoman of a crew. You should have seen how that girl blossomed out. (Laughter) And the boys liked to be bossed by her, too. Do you know what happened after she graduated? She married one of the boys who was under her. She went into hot house lamb production. She slaughtered her lambs, loaded them into her sedan, and every week when her lambs were going to market, she took them to market herself. She did the entire job.

Do you know that we have more requests for 417 -- our course is called 17 and the advanced course is 417. More boys come and ask, "May I take 417?" I look at them and I say, "Are you able to teach this course?" I know whether or not they are. I just want to see how egotistical they are. They say, "No, but I want to learn more about it." So I do the same thing with them and they help me to teach my cutting course. In other words, I had gone along since 1919 trying to do all this work myself and I had to wait until I was between 60 and 65 (laughter) to find out how much unnecessary work I had been doing.

You know these kids turn out in great shape. They have the responsibility put on them, and you ought to see how they pick it up because they have to in order not to be dumbbells before the members of their classes.

DR. MACKINTOSH: Thanks. I am sure that all of us would have been very disappointed had we not had a word from Tom Ziegler. (Applause)

Now I think it is time to turn it back to our Chairman here.

DR. NAUMANN: Thank you, Davie.

We knew that some thought-provoking comments would be made about the courses that we teach. We are not satisified. However, that is not unusual. We have not been satisfied for ten years with the courses that we teach. We think that it is going to work out pretty well with the proper modifications.

I would be amiss if I did not recognize our ambassador to Europe who has just walked into the room -- Dr. Brady. (Applause)

One thing more before we are released. George Wilson would like to discuss with you the details of the short course.

(Mr. Wilson gave the details of the short course.)

CHAIRMAN BLUMER: Thank you, Don, and the members of your committee for a fine presentation.

Before we leave I am sure we are all anxious to hear the results of the election of a new Chairman. Jerry.

DR. WANDERSTOCK: Our new Chairman is Vern Cahill, of Ohio State University. (Applause)

CHAIRMAN BLUMER: I have 25 minutes of one. Let's be back here at 1:20. Maybe that is cutting you a little short, but it is necessary that we do that in order to finish up in time to eat tonight.

(The meeting recessed at 12:35 o'clock.)

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TUESDAY AFTERNOON SESSION

JUNE 11, 1957

The meeting convened at 1:30 o'clock, Chairman Blumer presiding.

CHAIRMAN BLUMER: Please be seated.

The chairman of the next committee has secured very good speakers for this program. So I will turn the program over to the Chairman of the Lamb, Veal and Calf Carcass Evaluation Committee, Dr. R. W. Bray. Bob. (Applause)

DR. R. W. BRAY: For that hand I should give a speech, but I am not going to. (Applause) This is the most popular approach yet, I guess.

We have two subjects to cover with this committee. One is the subject of lamb, and the other one is veal and calf. We split it into those two sections, and since we are short of time, we are going to start in right away with the program.

Our first speaker is going to talk about carcass quality indicators as related to eating quality of lamb. That is a tough assignment. It is easy for me, I guess, to sit back and dream up these topics, but it is not so easy when it comes to giving out information from the literature or elsewhere on the particular subject. But I prevailed upon our good friend, Glenn Kean, from Pennsylvania State University, to tackle the subject. He consented, and we are certainly happy, Glenn, that you are going to present the subject to us today.

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CARCASS QUALITY INDICATORS AS RELATED TO EATING QUALITY OF LAMB

GLENN R. KEAN

THE PENNSYLVANIA STATE UNIVERSITY

This is a million dollar subject, for if I had the answer to what makes a lamb carcass flavorful and tender, I'd patent it and sell you the information. When Bob asked me to talk for about ten minutes on this, I wrote him that I'd entertain you for that long so I started thinking about the subject along those lines and soon discovered that I was not an entertainer, so I felt I'd just discuss a few general things that might mean something as far as tenderness is concerned and hope the discussion will be the educational part of these ten minutes.

It seems to me we have kicked the word "quality" around enough to know that from a meats standpoint we know what we are referring to but we don't know what it means. The phrase "eating quality" could mean that it is or isn't fit to eat and man was eating lamb long before Bible times, so we know it won't hurt you if you eat it.

Seriously, I want to just point out a few things that we think we know will make a lamb carcass desirable to eat and some things that maybe we -- or at least I--don't know. What do we think we know? We think we know that age, feeding, health of live animal, and -- most important of all -- cooking will affect the eating quality of lamb.

How much, then, can we see when we look at a carcass? We can see the conformation but I, for one, do not think that that is important when it comes to eating. We can tell something about its firmness but what does that tell us? We criticize a carcass for being soft and yet they get $15 to $40 a plate for a lamb dinner at the big clubs in New York and other cities for hothouse lambs and they are a good many grades away from being firm. We think we can tell something about the way it was fed by looking at a carcass but what does that mean? It may mean that it has a lot of fat that most people won't eat or that it has none and, therefore, must be graded down.

We can tell about how old the animal was by looking at the carcass and this is, no doubt, one of the most important criteria for predicting eating quality. We now place a lot of emphasis upon this factor and sometimes it kicks back because two lambs of the same age will "eat" differently. Color of flank has been suggested as a good indicator of quality and I believe it is important but not the answer. Far too often a dark carcass, with Choice conformation and quality, as we think of it, will eat just as well as a light carcass with the same conformation and marbling.

We do know that there is some correlation between eating quality and grade, however, and Professor Ziegler and a couple of students ran a

little shotgun experiment with the grand total of five carcasses to see if they could detect any difference in flavor and tenderness. They broiled the chop and found that there was very little or no difference in tenderness between Prime and Choice but a noticeable difference between the two top grades and Good. They also noted the flavor increased as the grade increased. This, of course, was with five lambs of four breeds which leads me to ask, Does breeding or breeds not have some importance in this subject?

I certainly have not found in the literature or elsewhere any quality indicator such as thickness of leg, width of dock, color, or any such indicator that will guarantee a housewife that this carcass will eat well. We still, as far as I can see, must rely upon the graders to do the best with what we know to properly grade the carcass and then devote most of our effort in an educational manner to instruct the housewife in proper cooking. In other words, I feel the factors we take into consideration when grading are still the best we have and, fortunately, most of the time they prove out. We must, however, try to educate the cook to know that a chop from a young, well-marbled bright colored Prime lamb carcass will be dry and tough if she broils it for an hour. I do feel that we sometimes give a carcass too much credit for being young in our grading and grade one into Choice or Prime only to find that there is little or no marbling in the meat. We justify this by saying that because it is young, it must be tender. I think that most people consider a piece of meat "good eating" if it is tender, and if it is juicy, a large percentage of consumers will consider the meat to be tender or at least good eating. This leads me to say that I feel, personally, that marbling is still the best indicator in a carcass to determine eating quality. I say this in spite of the published data recently put out by our friends at Beltsville in regard to marbling in beef. Age is certainly an important factor but the presence of marbling cannot be overlooked in my opinion as the major indicator. Certainly we need to do more research on tenderness and flavor as related to age and/or marbling. We need to study what effect diseases, such as scours or pneumonia, have on eating qualities and the inheritance factor of individual rams and ewes upon tenderness and flavor. As I thought about this subject, I came to the conclusion that at least I didn't know many answers and if the rest are as ignorant as I, we don't know much about what indicates eating quality.

I hope I have made you think about this subject and maybe even insulted your intelligence so that you'll tell me some of your secrets in the discussion that follows.

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DR. BRAY: Glenn asked me when I saw him earlier this year what he should talk about. I said, "If you do nothing more than to stimulate some interest to do some research with lamb then you have done the job." He has raised a lot of questions here, and he has also let us know that there is very little information available.

We think in terms primarily, I suppose, of research with beef and also with pork, but I think it is just as much needed in this area, too.

Also I am glad that we had Glenn on as the first speaker after lunch because I think he livened us all up well, so that we are ready to go along with the program now in good shape. I don't mean to infer that Mr. Murphey is going to put you to sleep. But he is going to talk to us about changes in federal standards for lamb. We thought this would be a rather timely subject because there has been a recent revision in the lamb grades, and we thought that no one could bring the message to us any better than Charlie Murphey. So, Charlie, we are about to introduce you. Charlie Murphey of the Standardization Section of the U. S. Department of Agriculture. Charlie. (Applause)

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SOME RECENT CHANGES IN LAMB CARCASS GRADE STANDARDS

C. E. MURPHEY

UNITED STATES DEPARTMENT OF AGRICULTURE

As most of you here know, the official United States standards for grades of lamb, yearling mutton, and mutton carcasses were changed this last February. Those changes were made in strict accordance with the Administrative Procedure Act which specifies that no such official action shall be taken until the proposal has been published in the Federal Register and opportunity given for all interested parties to comment thereon. Very few comments were received on the proposal and all of these were favorable to the change. Most of the changes, as proposed and adopted, were an outgrowth of a series of meetings with various segments of the industry and were recommended to the Department by an industry-wide committee appointed by the National Wool Growers Association.

So much for the background. Now for some of the significant changes. For purposes of this discussion I would like to divide the changes that were made into two general categories--those that affected grade lines, and those that had no such effect but rather, were made for purposes of clarification of certain aspects of the standards and to increase the accuracy with which they could be interpreted.

In general, the changes that affected grade lines lowered the minimum requirements for certain kinds of carcasses in the Prime and Choice grades but tightened the minimum requirements for lambs in the Good grade. As you know, the standards are formulated on the premise that increasing quantities of certain fat deposits--feathering between the ribs, fat streaking in the inside flank muscles, and overflow fat over the inside of the ribs adjacent to the backbone--are required with advancing maturity if the same relative degree of quality is to be maintained. It was the general feeling in the industry that the grading of the more mature or so-called "old-crop" or "fed" lambs in the Prime and Choice grades was relatively too tight by comparison with the grading on the younger or so-called "spring" or "milk" lambs. Therefore, only the minimum quality requirements for the more mature lambs in the Prime and Choice grades were relaxed. The minimum quality requirements for young lambs of these grades were not changed. However, another new provision in the Choice grade which further relaxes the standards for some kinds of carcasses is equally applicable to all maturities alike. This provision permits carcasses with superior conformation--mid-point Choice or better--to qualify for Choice with quality equivalent only to the lower limit of the upper third of the Good grade. This provision is new to any of the various grade standards. In none of the other standards is a superior development of conformation permitted to compensate for an inferior development of quality in the Choice or Prime grades. In the Good and lower grades, this type of compensation is permitted in all of the standards but only in the lamb and mutton standards is this permitted in the Choice grade.

It was also generally agreed by the industry that the minimum quality requirements for the Good grade were too low--particularly for very young lambs. Consequently, these requirements were tightened somewhat with slightly more tightening for the very young lambs than for the more mature ones.

There has been no way to determine the comparative percentage of the lambs produced which would have qualified for the various grades under the present and previous standards. It can be seen, however, that the changes in the Choice grade standards were substantial and feasibly could have made it possible for a sizable portion of the lambs which formerly were eligible only for Good now to be graded Choice.

Although the industry was particularly interested in the changes I have just described which affected grade lines, we were equally interested in some of the other changes which did not affect grade lines because we felt that they would make rather substantial improvements in clarifying the intent of the standards and facilitating their interpretation. Most of these changes were made in the "Application of Standards" section of the standards rather than in the standards proper. I would like to comment very briefly on a few of these changes and indicate their significance.

One such change, or rather, addition, relates to the evaluation of conformation. Strange as it may seem, in none of the meat grade standards had there been any detailed discussion of how to evaluate conformation. While such omission probably has done little damage in the past, because most everyone apparently has agreed rather closely on how to evaluate conformation, the discussion as now presented does indicate rather precisely the principles involved in evaluating this factor. There are a couple of points in this discussion, however, that I would like to elaborate on just in case some might not have a complete understanding of the principles involved. With respect to consideration of the proportionate development of the various parts of the carcass, the standards indicate that in addition to considering the relative proportion that each cut is of the carcass weight, attention should also be given to its general relative desirability. Thus, although the leg and shoulder are approximately the same percentage of the carcass, since the leg is the more desirable cut variations in its conformation should be given more consideration than variations in conformation of the shoulder. This latter aspect may be new to some. The other point I would mention pertains to the extent that external finish is considered in evaluating conformation. The standards indicate that while conformation is primarily a function of the development of the muscular and skeletal systems, it also is influenced by the quantity of external finish. This, I think, has generally been done in the past. However, the standards now go one step farther and indicate that the extent to which external finish is considered in this evaluation is limited to that which is normally left on retail cuts.

Another addition to the "Application of Standards" section is a discussion relative to the evaluation of quality. In this, it is indicated that the most important consideration is the development of feathering between the ribs, that the fat streaking in the inside flank muscles is next in importance, and that both of these are much more important than the quantity of overflow fat over the inside of the ribs adjacent to the backbone. It is also indicated that firmness of fat is a quality determining characteristic.

In this same connection, I would also like to comment on the deletion from the standards of all references to quantity of external and kidney and pelvic fats where any minimum quantity of these might be construed as being a requirement for any grade. This incidentally, reduces the so-called major grade factors to two--conformation and quality. Prior to this revision we were continually accused of requiring more fat on Choice grade carcasses, for instance, than any of the trade wanted. We always pointed out to such critics that when most lambs had developed their other quality indicating characteristics sufficiently for the Choice grade they also would have developed the quantities of external and kidney and pelvic fat specified for Choice. That being the case, we contended that, for all practical purposes, the quantities of these fats were actually not a grade factor. However, in view of those criticisms, we decided to resolve the issue by eliminating such references from the standards. Since these fats make no direct contribution to the desirability of a carcass except as they are related to the quality of the meat and since there are other fat deposits which we feel are much more closely related to quality, we do not feel that the elimination of references to quantities of these fats in any way impairs the usefulness of the grades.

Another aspect of the standards that was modified slightly is the channel through which color of lean is given consideration. The revised standards indicate more precisely than did the former ones that color of lean is a factor used in connection with the determination of maturity.

The last change that I would mention is with reference to the manner in which a superior development of quality is permitted to compensate for an inferior development of conformation. It is now quite clearly stated that this type of compensaion is permitted, without limit, in accordance with specific illustrations as indicated for each grade.

As I indicated at the beginning, none of these latter changes, additions, or deletions from the standards have affected the interpretation of the standards as done by official graders. All grading personnel had been instructed to evaluate all of these considerations in the same way as they are now written. However, the manner in which most of these factors were referenced in the standards was, admittedly, somewhat nebulous. We feel that the workability of the standards has definitely been improved by these changes and that if and when revisions are proposed in the standards for beef, veal, or calf carcasses, many of these same improvements will be incorporated therein. Thus is the process of evolution as applied to grade standards.

Because of lack of time I have not discussed these changes in detail. However, I hope that this brief presentation has cleared up any misunderstandings that any of you might have had with respect to the changes that were made in these standards.

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DR. BRAY: Thank you, Charlie, for that fine presentation.

Next we will call on Dr. Breidenstein who will lead the discussion on the first two papers.

DR. B. C. BREIDENSTEIN: Thank you, Bob.

Members of the Conference: I did not receive a copy of Glenn's paper and I think I see why now, but this morning I asked him what he expected to say and, contrary to what he told Charlie Murphey, he told me that he did not expect to say anything. However, having heard Glenn perform before I did not believe that. So I sat there and listened. I think it was a very refreshing treatment of the subject, and probably one of the most important aspects of it is the fact that it was a revelation of our own ignorance, which seems to be the theme of today's presentations. I don't think this is unexpected either because at least most of us are willing to admit it.

I will leave the questions to be directed toward Glenn, if he has any solution of some of the problems which he mentioned and which certainly are prevalent.

The second paper was very ably presented by Mr. Murphey concerning the recent grade changes in lamb. I think the evolution of the grade standards is continuing to keep pace with the changing consumer demands, and this must be the case if grades are to serve a useful tool in the distribution of our lambs or any other meat products.

It would seem to me evident that the fact that few comments were received on the proposed grade changes prior to their going into effect would indicate that there is quite unanimous agreement on the need for such changes.

The telescoping of grades is one thing I don't know that I quite understand, the lowering of the standards for the choice and the prime and the more strict requirements for the good grade, but it probably is in keeping with the demands that are currently made.

Clarification for more effective use and application certainly was due, and I haven't seen the new standards, but I hope they are more clearly defined than previously and I am sure they are. The fact that the conditions for grading and the description of the compensating factors are now specifically stated and not assumed is certainly a step in the right direction.

I had only one question when I read Mr. Murphey's paper and I don't believe he touched on it too much. But the question I should like to direct to him before I throw it open to anyone else is a question concerning the reasons for the change in the relative emphasis on conformation and quality in the choice grade. Are there specific reasons for the fact that conformation can now compensate for quality whereas prior to the change it could not in the choice grade?

MR. MURPHEY: I don't know that there is any one answer that can be given to that. The need was quite pointed. They were wanting

some reaction on the choice grade, and that seemed to us to be one of the least objectionable ways at least of getting this accomplished. The fact that lamb is a young kind of animal to begin with possibly we do not need to be too much concerned with the quality aspect of lamb meat as we do with beef and, therefore, we thought that it might be acceptable to permit superior conformation to compensate for the lack of quality in the choice grade.

DR. KEMP: I noticed that you said there was a unanimous group of leaders favoring this change of grades. I am wondering if those people who wrote in were not pretty much members of the group who proposed this grade change. As you know, they published this in the Federal Register, and maybe I am dumb but I don't know where I will ever see the Federal Register. I wonder how many of you here saw these proposed grade changes before they went into effect? Four people out of this group saw these proposed grade changes. I know a lot of people who would have opposed them if they had known about them and had seen them. Sure, they were published in the Federal Register but our sheep farmers don't have the Federal Register, and I should like to know where we can see the Federal Register.

MR. PIERCE: In your library. I am sure that you will find a copy there.

DR. KEMP: It may be, but I won't usually be looking for it unless I know that something specific is going to be in it.

MR. PIERCE: That was not meant to be facetious. I am sure that you will find a copy of it there. However, there are press releases on any changes of this kind, and they get into practically all of the newspapers. It may be on the back page or the middle page of the newspapers in your areas. Also it gets into a number of the farm publications calling attention to the fact that a change is being made and calling attention to the fact that the details are being published in the Federal Register.

The Federal Register is -- it may be unfortunate in this case -- the mouthpiece of the Federal Government and by regulation it has to be in there. There is no reason it could not be published other places, of course, but the press release does call specific attention to the fact that a change is being made.

MR. MURPHEY: It also indicates that copies of the change can be gotten from us there in Washington.

DR. KEMP: I saw this in National Provisioner, but the notification of the change, that is the only place I remember it. But most of the sheep men won't get the Federal Register. It may have been other places but I did not see it.

MR. HAZALEUS: I should like to ask Mr. Murphey the status of grading these lambs. I realize that when they break out with their permanent teeth they may not be lambs. What is the status of federal grading of these lamb carcasses if they have two permanent teeth?

MR. MURPHEY: When we grade lamb carcasses we don't know how many teeth they have.

MR. HAZALEUS: That is not what the buyers from Swift and Company were doing. They were mouthing them to pick out the ones with teeth because they were not paying as much for those with teeth. I handle the lambs and I am not an expert, but they were buying those lambs $1 to $2 cheaper than the lambs that had lamb mouths. They may have weighed four or five pounds more than the others.

MR. MURPHEY: Of course, that is the criterion that the trade and the industry are using to differentiate between lambs and yearlings alive.

MR. HAZALEUS: Are they grading them on these carcasses here? They gave me the impression they were grading these lambs. They checked them with their heads on so they could look at their mouths.

MR. MURPHEY: As far as I know, no federal grader is looking at the teeth to determine the classification.

MR. HAZALEUS: Well, the federal graders are looking at the teeth in the lamb carcass class with the heads off.

MR. MURHPEY: I don't know whether they are looking at the lamb carcasses or not. I won't say that they are or they are not because I don't know. The point that I was getting around to making is that in live animals the presence or absence of the first pair of permanent teeth is generally accepted as the criterion for distinguishing between lambs and yearlings. That is included in our official description of the differentiation between lambs and yearlings and live lambs. Presumably our standards for live lambs and carcass lambs are related. Whether or not they are perfectly related I do not know for sure, but presumably the standards for carcasses reflect as nearly as we are able to make them the standards for live lambs. That being the over-all intent of the standards, we try to apply such evaluators of maturity in carcass lambs as those alive. The extent to which we accomplish that I am not able to say. I don't know.

MR. HAZALEUS: Is it true that it is an effort on the part of some of the packers to chisel $2 or $3 on 15 or 20 head out of a carload to make up the expenses of the buyers that day?

MR. MURPHEY: That I don't know.

MR. HAZALEUS: These people are not grading them until their heads are off and they are in the cooler. Then why are the packers trying to chisel off a little. I will admit that it isn't much -- $1 or $2 -- but it does not seem right to me when they will go to the same place with the same grade.

MR. MURPHEY: That I don't know. I am sure that the number of those that we grade as yearling and the number of carcasses that we will

grade yearling of the live animals that you are talking about will be higher than those that don't have their permanent teeth.

MR. HAZALEUS: If a grader runs across a lamb that does not have a break joint what do you do with him?

MR. MURPHEY: We do not grade him a lamb.

MR. HAZALEUS: He is not a lamb then but you don't see his head?

MR. MURPHEY: No, we don't see his head. He may not have a couple of pair of permanent teeth. We still don't grade him lamb.

DR. ZIEGLER: Do you have any confessions to make, Charlie? (Laughter)

MR. MURPHEY: No, no confessions.

DR. ZIEGLER: You know that you labor in a bureau that is under pressure. Now where does that pressure come from? Confess to the group here.

MR. MURPHEY: I don't think I am qualified.

DR. ZIEGLER: Does it come from the packer, the buyer or the producer, or from all three of them, for change in grades?

MR. MURPHEY: I think most of the interest in this change emanated from producers. Certainly it is from producers and packers, if you want to include anyone else besides producers. It is not from the consumers. I don't think that is unreasonable to suspect because I think these standards are primarily designed to aid producers. I think producers should have an interest in them. I think they are to be commended for taking an interest in them.

DR. ZIEGLER: From producers?

MR. MURPHEY: I think so.

DR. ZIEGLER: Did you fellows hear that? It is news to me.

DR. BREIDENSTEIN: I think we will have to bring this to a halt, and I wish to thank those who presented the papers.

Now I will turn it back to you, Bob.

DR. BRAY: Thank you, Bernie.

Well, it is an interesting subject, and I am certainly glad that we have the federal grades. I don't want, Charlie, you or John Pierce or anyone else, to go back to Washington figuring that we don't appreciate your coming out here, because without grades we would be in a fine fix in the livestock industry, in my opinion.

Now, turning to veal and calf evaluation, one subject that we are going to cover is a subject that was started last year, and that is with regard to the cutting procedures, but the other subject that we thought would be of interest to you is what is going on in the retail meat business as regards the merchandising of veal and calf. We hear so little about it. Many times in some of your states you probably see very little veal. In Wisconsin, of course, it is an important byproduct for farmers over almost the entire state.

I suppose that it was only natural that we should turn to a Wisconsin man to discuss this subject, "Challenges in Merchandising Veal and Calf." We turned to one of our outstanding retail distributors, an organization that works with retailers in Wisconsin, that being the Godfrey Company. Representing that company today to talk to us on the subject is Mr. Irv Rinehart, who is director of provisions for the company, which includes dairy and meats. (Applause)

MR. I. RINEHART: Thank you very much, Bob.

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MERCHANDISING VEAL AND CALF AT THE RETAIL LEVEL

I. RINEHART

GODFREY COMPANY

The subject I'm to discuss today is "Merchandising Veal and Calf at the Retail Level". In this connection I suppose that if we devoted only a few minutes to discussing ways and means of merchandising veal, we would be contributing fairly to its share of time, based on its volume contribution in our retail meat markets. However, I must confess that there is a severe laxity on the part of most retail meat people to do these things which would increase the popularity of veal as a frequent and regular menu center, around which consumers can find variety for their family enjoyment.

Before we actually get into a discussion of veal merchandising, I would like to identify our company as the supplier of I.G.A. and Sentry Markets in southeastern Wisconsin, serving some 200 retail food outlets. Some of these stores are small, others are quite large. In the Milwaukee area we rank third in food distribution, but in most of the smaller towns, from suburban Milwaukee, north and west, our stores are ranked first in serving the communities. About six years ago these independent grocers and meat retailers were banded together as one group of people, reaching for like quality standards, cutting procedures and more volume through smarter, better planned, merchandising, backed up by effective advertising and promotion. This band was called "Table-Rite Meat Departments", the name now being used by I.G.A. to identify their meat operations from coast to coast and in Canada.

Marketing situations today and everyday, vastly affect our interest in veal and/or other rail stock. It can be correctly said that the retail food people are interested in providing consumers with what they want, but always keeping in mind the true values that the daily market can provide every shopper. Today's housewife is plagued with a great responsibility in providing meals for her family despite the fact that a recent congressional subcommittee fact-finding board revealed that "food costs to consumers have not risen proportionately with salaries or income". In other words, a lesser part of the income is required to purchase food today than was required from the income of 5 or 10 years ago. It is the constant quest of our meat buyers to ferret out the best dollar and cents meat values for our family food buyers, bearing in mind she may have set her heart on something other than the best value before coming to us to do her shopping.

You may recall the surplus pork and extremely low market on hogs and pork as a result of that surplus, making pork a real dollar and cents value. The same is true with heavy receipts of beef, making it attractively priced. It has been difficult the last few years to find the veal market really attractively lending itself to hot values in meat departments. I can think of several reasons why this is true, prime of which is a change in marketing habits of the dairy farmer. Several years ago the American Dairy Association

and the State Departments of Agriculture entered into a campaign to sell more surplus dairy products, (butter, milk, cheese, etc.). One of their major problems in doing this was to upgrade the dairy farmers' facilities to a point where quality production could be stressed in the sale of their items. In order for a diary farm to produce Grade A milk, it had to have solid ceilings in barns, painted or whitewashed surroundings for cattle, a milkhouse equipped with mechanical cooling systems for milk, separated by at least two doors from the stable itself. Cattle have to be curried, clipped and clean. Barns must be cleaned at least daily. Herds must be tested and accredited to be free from diseases such as Brucillosis, T.B., and frequent checks are made for Mastitis and Undulant Fever.

What does all of this have to do with merchandising veal in retail stores? Let's find out.

Many farmers, with larger herds of dairy cattle, planned their cattle breeding season in August and September which would bring their cows fresh (or calve) in May and June. They did this because their barns were not warm enough to milk in the cold months of the winter. They had no milk houses and would haul their milk cans to the nearest spring or creek and set them in water to keep the milk cool until it was picked up the following morning to begin its long journey to the factory, creamery, or condensary. When the State Department of Agriculture stepped in and told the dairy farmer he couldn't receive top price for his milk unless he performed under certain prescribed regulations he began to warm up his barn with ceilings, plaster and plaster board, insulating and painting the walls. He built milk houses, installed cooling systems, tested cattle for disease, weeded out poor producers and generally went to quite an expense to get a Grade A standard of production.

This expense could not go unrewarded. He began to freshen cattle the year around, taking advantage of higher prices paid for milk during winter months, which his extensively expensive equipment required considering the expense of his new investment. No longer do we see the ups and downs in veal calf receipts at public markets during the various months of the year. Calves are coming into stockyards every month of the year in quite consistent numbers. The market situations have become more constant also, taking veal out of a cheap variety of meat during heavy marketing seasons as we were formerly accustomed. Yes, it's true, veal is now a luxury class of meat, bearing price tags much higher than its mature brothers and sisters.

In the past three or four years, we have found that quality veal has ranged from a price consistent with U. S. Choice grade beef, to as much as six cents a pound over then-existing beef prices. This situation has taken veal out of a competitive meat item class and unless lower grades of veal are used, has actually placed it into a luxury fresh meat category.

One definite help in veal availability has been the general acceptance of artificial insemination of dairy cattle. We no longer see the dairy herd sire staked along the roadside, but in his place the modern dairy farmer receives the irregular but dependable visitation of a technician schooled in that service. This means the male veal calves are sold as veal and not maintained for breeding service.

We feel that our company in Wisconsin does a better than average job of merchandising veal as we periodically plan promotions using it as a leader. In preparation for this paper, I asked our major suppliers to get figures on veal sales from our major competition as compared to their total meat sales. Their figures run as follows: A-Veal to total meat sales 1 1/2%; B-Veal to total meat sales 2 1/2%; and C-Veal to total meat sales 2 1/2%. Our sales run around 3 1/2% of total meat sales and on promotions will go as high as 6 or 7% of total meat sales.

Proper retail meat displays have helped us sell more veal. It has been the opinion of some retail display experts that all fry-meats should be located together, whether beef steaks, lamb or pork chops, or veal round steak. They advocate all roasts be displayed together, whether lamb leg, chuck roast, pork loin roast or veal shoulder roast. About 18 months ago we held a clinic on veal and lamb merchandising and decided to display all veal in one section and all lamb in another section. Consumers voted on this method of display when they began to remark, "I see they have veal and lamb here now," or they might say, "What a nice veal display. They have steaks, roasts, chops and other cuts, too. I can find what I want now". Too long have we used theory rather than common sense in display. We have learned that just because something was done a certain way last year, doesn't make it right today. In fact this idea was coined by Mr. Godfrey last January at our annual sales meeting when he said, "Look at your responsibilities and see that you are doing the same today as you were a year ago. A close, honest appraisal will probably prove anything being done the same today as a year ago, to be wrong."

We advocate the sale of veal shoulders as a boneless roast instead of a bone-in piece of consumer confusion, so full of carving obstructions that years will pass and old age will o'er-come her before she will be stuck with another of those disappointments. A boneless veal shoulder roast is not difficult to make, but does take time. Profit-wise they are healthy because they sell, and a retail unit can purchase carcass veal rather than extra hind saddles to maintain even movement of all veal cuts. Several stores are doing such a fine job on boneless veal shoulder roasts that they are purchasing extra fronts from which to make them. Profit-wise this is very healthy.

We insist that our market managers cut the rib bones short on veal chops. No more can she get from us those long banjo shaped veal or lamb chops that have the flank or belly meat curled up on the rib bone and sold as part of a chop. We advise our market managers that there are two types of muscles in a carcass - those of locomotion and those of support. They should never both be sold on the same retail cut of meat.

We have prepared a consumer program which is called "From the Western Range to the Kitchen Range", where we spend most of our time talking about our quality beef program. However, we never pass an opportunity to discuss with the audience the fine veal, lamb, and pork departments in our stores, spelling out the quality of our merchandise and the variety of our offering. If I were to reveal our most valuable asset in our fairly successful veal program, I would say it's our consistent quality program, using mature veal, white in color and firm in texture; calves weighing, skinned out, 110 pounds to 135 pounds each. These veal calves are from 4 to 6 weeks of age; old enough to be themselves and not so much the cast-off of their mother's body. This makes

veal eaters come back to us for more veal. Veal roasted with pork compliment each other and we frequently advertise them as a combination deal. Ideas such as these make shopping easier for our customers.

There is no greater asset to a meat department than variety, and we constantly reach for 115 different fresh meat items in addition to sausage, smoked meat, offal and fish. One hundred and fifteen different items, each capable of complimenting any seven course meal. We know if our customers find the quality and variety of meat they want in our stores, they will stay with us to buy those other six courses. That's money in our pockets.

I would like to make a suggestion to some of you people who are responsible for consumer meat promotion. Retail meat people would appreciate the coordinated efforts of all livestock and meat interests, to print the most delicious recipes that our best home economists could develop, each of a uniform size, giving ingredients, preparation instructions and pictures, of every cut and type of meat we display at retail. A common recipe holder could be devised that would stand on service meat counters or hook on self-service counters, and could draw consumers' attention to "The Recipe of the Week". As it works now, when surplus pork is on hand, the pork growers and all factions interested in pork, set out on their individual way to sell pork. Then the lamb people set up another program on a different scale and type, to sell their product. Likewise, the beef people have their program. Could you coordinate those programs, setting up some similarity in them? All recipes should be made the same dimension, featuring timely meat cuts and not just items that need push but might not be seasonable. It seems that today's young housewife doesn't know how to prepare many of the meat cuts that we provide her out of beef, pork, lamb and veal. You would be interested to know that, second only to frozen orange juice, prepared frozen dinners are the largest selling item in our frozen food counters. We must appeal to more young housewives with meat, equipping them with the knowledge of how to prepare all cuts and varieties. Consumers most often used excuse for "no interest" in veal is that they don't know how to prepare it.

Yes, there are many horizons yet to be found in meat merchandising and especially in veal. Yet it is our responsibility to master each new horizon which we discover. Most horizons are under our nose waiting to be discovered. Some of us look out from where we toil and see on a horizon the slim lines of the hillsides or plains, interrupted only by a jagged point or a tree or hill. Others may look from where they toil and may see huge, tall buildings, jutting up from the ground, a monument to man's imagination. It's interesting that whatever direction we look for a horizon, that place is someone else's workbench. But there is one natural law for which there is no repeal. You must <u>look up</u> in order to see a horizon. Let's all look up and we may be surprised what new horizon we will discover.

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DR. BRAY: Thank you very much, Irv. I am sure that we all appreciate your taking time off from what I am certain is a very busy schedule to come down and talk to us.

I should like to introduce an associate of Mr. Rinehart, Mr. Floyd Gurkin who is meat merchandiser for Godfrey. (Applause)

Now next on our program to discuss the subject, "Suggested Cutting Procedures for Veal and Calf Carcass Evaluation," is Dr. Bob Kelly. Bob. (Applause)

DR. R. F. KELLY: I am passing out amongst you the procedure for cutting veal and calf carcasses.

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PROCEDURE IN CUTTING AND MEASURING VEAL AND CALF CARCASSES

R. F. KELLY

VIRGINIA POLYTECHNIC INSTITUTE

The proposed procedure is presented recognizing the fact that veal carcasses may be used for two purposes i.e., (1) a part of a study primarily on Veal and or (2) a part of a study of bovine development from birth to complete maturity. This procedure is presented primarily for those interested only in veal as the end product rather than as a part of a project designed to determine carcass development or composition in beef. Where the latter is of major importance the committee feels that the procedure for cutting beef carcasses as outlined in U. S. D. A. Technical Bulletin 926, Estimation of the Composition of Beef Carcasses and Cuts, 1946, and as presented and clarified by G. H. Wellington in the Proceedings of the Sixth Annual Reciprocal Meat Conference, 1953, pp. 73-79 should be used.

Cutting:

The carcasses should be split with a hand meat saw through the center of the backbone and neck. The ribs are numbered 1 to 13, No. 1 being next to the neck (Diagram 1). The Foresaddle is removed between the twelfth and thirteenth ribs by a line that crowds the twelfth rib its full length. This cut severs the flank at a point level with the union of the sixth and seventh vertebra, counting down from the pelvic arch.

The shank is removed just above the bony rise (lateral condyle of the humerus) in the middle of the arm on a line parallel to the breast or brisket. The breast or brisket is cut off on a line joining the shank cut with a point on the twelfth rib that is removed from the backbone a distance equal to two-thirds the length of the rib. The following is a uniform method of separating the plate from the rib. It is based on skeletal measurements and therefore, is more or less fixed (Diagram 2). Two instruments are necessary, a yardstick and a carpenter's try square. Point A (in Diagram 2) is the point of the body of the split vertebra. Point B is the cartilage or "button" of the thirteenth rib. The distance AB is measured and the distance from point A to point C is 61.5 percent of AB, measured to the nearest eighth of an inch. At point C a perpendicular is erected by means of the square. Where this line intersects the external circumference (point D) the separation is made, the cut being perpendicular to the external surface.

A 7-rib or rack is removed from the shoulder or chuck between the fifth and sixth ribs by a line that crowds the posterior of the fifth rib the entire distance. The chine bone and spinal processes are left on the rack.

The kidney is removed and the fat completely trimmed out of the inside of the loin. The flank is removed by a line that crowds the stifle joint

just close enough to cut slightly into the lean and crosses the thirteenth rib at a point coincident with the plate cut. Scrotum fat and udder fat are trimmed off the face of the leg and included with the flank cut.

The leg is separated from the loin by cutting squarely in a line at a right angle to the chine bone anterior to the posterior lumbar vertebra leaving one lumbar vertebra on the leg. Remove all except two caudal vertebrae with attached fat and lean.

VEAL OR CALF CARCASS MEASUREMENTS

Unribbed Carcass Side: (To be taken with side hanging on a rail)

1. Length of body - Measure from the anterior edge of the aitch bone to the anterior edge of the first thoracic vertebra.

2. Length of hind leg - Measure from the anterior edge of the aitch bone to the highest point on the tarsal bones in the hock joint.

3. Depth of body - Measure from the dorsal side of the spinal canal at the fifth thoracic vertebra to the ventral side of the sternum with the tape being held parallel to the floor.

4. Length of loin - Measure from the anterior edge of the aitch bone to the middle of the 12th thoracic vertebra.

5. Width of shoulder - Measure from inside the carcass at the first thoracic vertebra to the outside of the shoulder with 20-24 inch outside measuring calipers. Hold the axis of the calipers in a median plane to the carcass and parallel to the floor. The sum of the measurements of the right and left side is used.

6. Width of Leg - Measure with the calipers from inside the carcass at the highest point of the aitch bone to the outside of the leg. Hold the axis of the calipers in a median plane to the carcass and parallel to the floor. The sum of the measurements to the right and left sides is used.

Ribbed Carcass Side:

The measurements from the ribbed carcass side are designed to characterize the longissimus dorsi muscle and the adjacent external fat (if any). The measurement is taken from a tracing of this portion of the carcass. The tracing should be made on a transparent non-absorbent paper which has a suitable surface for writing. PTM-173 tracing paper or "AQUABEE" acetate sheeting meets these specifications. A sharp pointed lead pencil should be used when making the tracing. The eye muscle and external fat (if any) are traced as indicated in diagram 3.

1. Area of eye muscle - Follow the outline of the eye muscle with a compensating polar planimeter.

2. Length of eye muscle - Distance of long axis of eye muscle (AB).

3. Width of eye muscle - Three measurements are averaged for the width of eye muscle. The first (CD) is made perpendicular to the line used in determining the length of the eye muscle at a point one-half the length of the eye. The second (GH is parallel to the first at a point one-fourth the length of the eye muscle from the ventral edge of the eye muscle. The third (EF) is parallel to the first at a point one-fourth the length of the eye muscle from the dorsal edge of the muscle.

Subjective Scoring:

All carcasses should be graded to the nearest one-third federal grade (SRA - PMA - 114). The grade should be determined by a committee of government graders.

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DR. BRAY: Thank you, Bob.

And now to lead the discussion we will turn it over to Dr. Jim Kemp.

DR. KEMP: Thank you, Bob.

Conference members, I think we have had two very interesting presentations here, and we want to thank Mr. Rinehart for that very excellent presentation on lamb.

I want to throw out a challenge to next year's committee to do the same thing for calf because down in our part of the country we have some beef which we are not too proud of some times, which fits neither into veal nor calf, but we have it and it has to be merchandised, and I think that next year we should come up with some proposals.

Do we have any questions to direct to Mr. Rinehart at this time? Evidently you covered the subject pretty well. This is unusual with this group.

DR. PALMER: Will you describe just a little more explicitly how you fix the veal and the pork together as a roast in merchandising it?

MR. RINEHART: I was afraid somebody would ask me that because I am not a cook and I don't know exactly what the seasoning is, but we recommend that a boneless veal leg and a boneless pork shoulder roast are two very good examples of two types of meat that can be roasted together.

DIAGRAM I

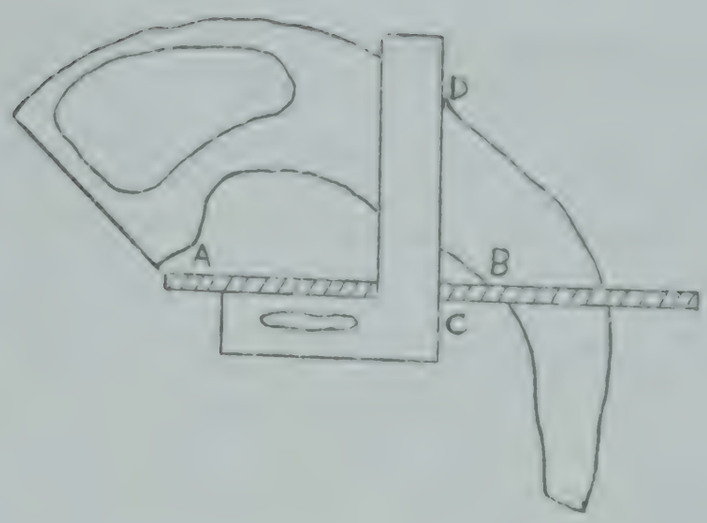

DIAGRAM 2

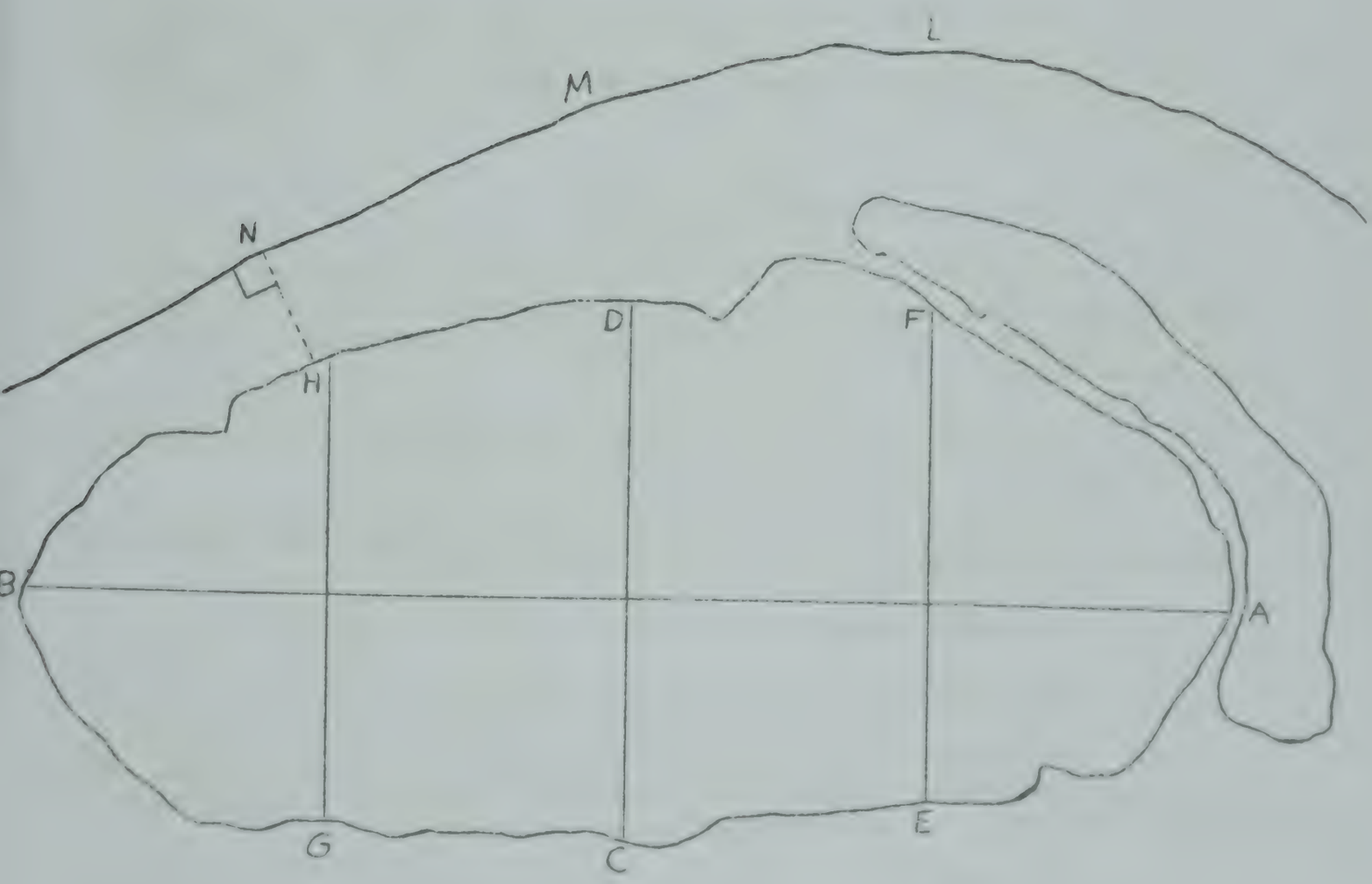

DIAGRAM 3

However, I am sure that any veal or pork roast would make a good combination. As to the seasoning, sir, I would not be able to tell you.

DR. PALMER: You answered what I was interested in.

DR. KEMP: Any other questions or comments to be directed to Mr. Rinehart?

All right, we will proceed to the second paper on recommended cutting and measuring procedures for veal and calf carcasses. As you know, last year at the conference a proposal was submitted but it was given back to the committee to revise. A lot of you were asked for suggestions on revising these procedures and they were taken into consideration, and this cutting and measuring procedure has been proposed for adoption.

If you will look at that you will notice that the forequarter is the same, I believe, as it is for beef and the hindquarter is different because of the place from which the leg of veal or calf is removed.

I will turn this over to Tom in a few minutes if we want to get a vote on adopting it. I think that we have had enough time to look it over. We have had a whole year. You were asked to send your proposals in but you still have the prerogative, if you want to, of turning it down.

Are there any comments on this?

MR. DEANS: I guess I can be excused from criticism because I was not here last year; so I can ask this question. Bob, I was wondering on your diagram 3, in working with beef, how do you proceed in determining points M and L?

DR. KELLY: I believe those are perpendicular to the outside of the eye from points D and N.

MR. DEANS: That is a line that would go from D to N and would approach the outside covering of fat perpendicularly?

DR. KELLY: Yes.

MR. DEANS: That is a bit of a problem.

DR. KELLY: I think it would be more of a problem in veal, since the covering in veal would be very much less. Actually I have placed very little value on that external cover in veal.

MR. DEANS: Well, say you have such a curved area as you particularly have at point L. At one point actually it approximates a curve very closely. How do you choose what point to arrive at? You don't have a flat surface to approach at right angles?

DR. KEMP: Bob, isn't that the same as was proposed for beef cutting?

DR. KELLY: Yes.

DR. KEMP: Maybe George Wellington ought to answer why that is.

MR. WELLINGTON: I am afraid I cannot answer that question. I do have another point I should like to ask about though. One of the discussions that I remember most vividly from our conferences is the one on the adoption of standard meat cutting procedures, and I was always disturbed that we decided to separate this plate and brisket at the angle at which it is shown on diagram 1. I just raise the question now as to whether we really do want to follow that line. I think that in commercial practice it is much more common to cut at a point near the lower part of the arm bone or the lateral tuberosity of the humerus and roughly parallel with the top of the chuck. However, this was discussed and it was agreed at that time that we would follow this angle that is shown in diagram 1. I don't think this is as much of a problem with veal, but we certainly would not cut beef that way even though it is listed as our procedure today.

DR. KEMP: I think that picture is a little misleading. If you use that yardstick in there I don't think you will get quite as close to the chine bone as this picture would indicate. I agree with you on that. I am not particularly endorsing this angle.

MR. LYLE ALLEN (University of Illinois): I am just wondering how you can tell when removing the kidney fat when you have gotten to the channel fat. In other words, the way it reads here you remove the kidney fat before separating the loin from the leg, whereas if the loin was removed first all the fat you would get out of there would be in the loin region. But since they are intact how do you know when you start to enter the channel fat?

DR. KEMP: The crotch fat, Bob.

DR. KELLY: Well, you remove it as completely as you can. There is a natural fold there that does not offer much of an obstacle so far as I am concerned.

DR. KEMP: Are there any other questions?

DR. ADAMS: I should like to answer Bob's question on the thickness of the fat. I think, Bob, if you will read that you will find that it is the shortest distance from this out to the outer edge of the fat and the same from D and the same from F in measuring the thickness of the fat and that, of course, will be relatively perpendicular to your outer edge. Of course, you will have a curve at L, and it is pretty hard to arrive at that; so you take the shortest distance. You put a measuring stick on that and you measure where it is coming out.

MR. DEANS: One thing I should like to see is a clause in here some place. When efforts are made, particularly to trace rib carcasses, we get a lot of variations from the angle from which the knife is approaching and perhaps you can cut these at right angles before they are traced.

DR. NAUMANN: I believe that is part of the procedure in beef, is it not?

DR. KELLY: I think, Bob, that you will find, if you go through the procedure for cutting beef as it is outlined, the angle of the knife and the fact that it should be on a plane parallel to the way the floor runs is pretty well describing how that eye will be cut down. There will still be a lot of variation, depending on who does it and the way the side is hanging but I think it describes it. It tries to describe it as completely as you can put it into words. I think that we have to recognize the fact that there will be some differences there, although it is fairly standard, I think.

DR. KEMP: I am going to turn this over to Tom and I guess he will entertain a motion from the floor.

I make the motion that this be adopted.

DR. ADAMS: Second.

CHAIRMAN BLUMER: It has been moved and seconded that this procedure be adopted. Are you ready for the question? All those in favor of adopting this procedure into our proceedings signify by saying aye; opposed. The motion is carried.

I think that most of us would be a little more comfortable if we would take our recess at this time rather than going on with the Personnel Committee. I think it will take no longer. However, before taking it the New Executive Committee would like to have your suggestions for next year. I think when you return you will find paper to write your suggestions down and then turn them over to the new Conference Chairman.

Let's try to get back here in five minutes, if that is possible.

(Recess)

CHAIRMAN BLUMER: We are ready to start the second part of our afternoon session, but before we do I see Dr. J. C. Miller, Dean of the School of Agriculture, Texas A. and M. College, is back there. Glad to have you with us. (Applause)

Now we will get over to the Personnel Committee immediately, and the year-round, hard-working Chairman of the Personnel Committee, L. E. Kunkle, will now assume the Chair. (Applause)

DR. L. E. KUNKLE: Thank you, Chairman Tom.

Most of you remember that the Personnel Committee was created for the purpose of looking after the membership of the Reciprocal Meat Conference and also for the placement of persons who presumably were qualified to do reaching or research or to join industry.

This year we are trying to follow precedent by bringing in as part of the program some things that we think will be helpful to all of

you who are advising and counseling these graduates, both for your program and advance study of animal science or animal husbandry who have a special interest in meat.

We have chosen a man who was trained as a chemical engineer, a graduate of Iowa State College. For a time he was an engineer for Seagram Distilleries. Then for personal reasons he chose to return to the land of corn and to live in Waterloo, Iowa, where I suppose you can say there is plenty of freedom, fresh air and fresh meat.

Mr. R. E. Burrell comes to us after having served in the capacity of plant superintendent and as director of research and development for the Rath Packing Company. In this responsibility he has contact with many graduates from our respective institutions and his placement experiences should be mutually beneficial to all of us.

It is with great pride and pleasure that we present Mr. Burrell, Director of Research and Development of the Rath Packing Company, who will discuss the subject identified in the program, Mr. Burrell. (Applause)

MR. R. E. BURRELL: Thank you, Larry.

Friends in the meat packing business or the meat business. I should not say packing business, but I am used to talking a little with meat packers. I have a text here which was submitted to the group for publication. I have difficulty sticking with texts but I was particularly happy to prepare this one because it is not often that a man in the meat packing business, in research and development, gets an opportunity to talk to a select group of this type.

I want to take this opportunity publicly and collectively to compliment the teaching staffs of the colleges who are supplying these graduates with meats training for industry. You have done a very realistic job of organizing your curriculum. You have done avery realistic job of handling your men. It is really a pleausre to have the young fellows come into the department and to give them a piece of responsibility and see them pick up that responsibility and go ahead and creatively handle industry's problems.

I have been asked to discuss the opportunities in the meat packing business for college graduates with meats training. I think that the meat packers should look at the opportunities afforded them through the graduates with meats training. These boys are helping us.

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OPPORTUNITIES IN THE MEAT PACKING INDUSTRY FOR COLLEGE GRADUATES WITH MEATS TRAINING

R. C. BURRELL

THE RATH PACKING COMPANY

During a visit to the Ohio State University campus, Prof. Kunkle invited me to discuss, with this group, opportunities for college graduates in the meat packing business. I accepted gladly, for it was recognized immediately as an opportunity to publicly and collectively compliment the teaching staffs of a large portion of the colleges supplying men of meats training for our industry. You men have realisticly organized programs in your respective schools which are equipping young men to produce good results in a very competitive industry.

As a member of a Research & Development Department, it has been gratifying to have these well-trained young men come into the organization to pick up a portion of the responsibilities and demonstrate an ability to conceive and carry out industrial assignments.

I have been asked to discuss opportunities in the meat packing business. Specifically, the following areas of application exist in our Company. Please understand that I represent Research & Development management in a fair-sized independent meat packing company. We are active in most areas expected, but have not diversified into many unrelated fields such as our major competitors have.

The Meats or Animal Husbandry graduate who likes to meet people, enjoys broad programs of endeavor in the animal nutrition and general agricultural fields, would be very happy to be placed in what we call the Agricultural Bureau. A large portion of this department's work is of a public relations nature and consists of assisting at Meat Animal Shows, judging, contacting farmers and Co-operatives, University extension work, etc.

The Feeds and Fertilizer Departments have a definite potential for your graduates. This is especially so with the advent of the many, many feed additives and the necessity of careful consideration of these items to insure that good customer relations are maintained. Certainly this Department of the major companies cannot be without an experimental farm for testing their own formulations. Here the graduate must be schooled in fundamental nutrition, livestock management, and animal experimentation design.

The proper purchasing of livestock is tremendously important, since 75¢ of every product dollar is raw material. Poor judgment in this area can be disasterous due to the small profit margins in this business. As you know, in many cases Livestock Buying is the Animal Husbandry graduate's dream.

Tremendous strides have been made in Science in the last decade. This has had its impact on the meat packing industry also. Thus Research &

Development containing Product Development groups has become a necessity to the meat packer. In this new area, properly coupled with Production, Provision, and Sales efforts, the well-trained meats graduate can make tremendous strides for his company and himself. Departments contributing toward increased packer earnings are easily discernible and this can be singled out for reward. This, as you know, is not mere conversation, but is reflected in the increased budgets for these endeavors. We, in our Company, feel that there is no better training ground for managerial personnel in all important company divisions than in the Research & Development Department.

The word "training" was brought out in previous comments. This subject receives considerable attention in the meat packing industry as in other modern industries. Currently our Company supports a Sales Training Program and a Supervisory Training Program. Ordinarily the Sales Program is for sales personnel, but we do use it for orientation of other new employees. The Supervisory Training Program gives men such as your graduates actual "doing" experience in the areas of Production, Quality Control, Provision, Chemical Control, and Product Development.

Specific opportunities were pointed out above. However, the fundamental opportunity for the graduate in industry lies with the attitude of top management toward his training, ability, and value to the Company. We are quite proud that our Company's management is placing more and more emphasis on the value of the college-trained individual for management positions. Advances in meat chemistry, packaging, and processing techniques have made them even more necessary. The graduate's ability to pick up responsibility and contribute to the over-all picture has aided this acceptance. The attitude of the employee is of similar importance. He must realize that industry expects him to get results. The college curriculum fundamentally trains a man in logical thinking, based on certain fundamentals. Graduates are typically creative, but all suffer difficulties in bringing assignments to a close and applying what they have learned before proceeding further. These areas of difficulty we recognize and help, trying not to retard the momentum of youth.

It is my personal belief that if your graduates receive some fundamental training in chemical-engineering principles, as well as the basic curriculum now pursued, he would be of a great deal more value to the packing industry to fill production supervisory needs.

As a final suggestion, let me urge you - "Do not allow your curriculum to stagnate". You are currently supplying an additional demand for meat scientists, particularly in Product Development. In order to broaden your students' opportunities, some attention should be given immediately to an industrial option, so to speak, so that they will be better equipped for production supervision in the meat packing industry.

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DR. KUNKLE: Thank you, Mr. Burrell, for this very concise and thoughtful suggestion.

Now following precedent, I suppose we ought to give all of you a chance to ask him questions. Is there anyone who would like to ask a profound question about personnel management that would relieve his feelings?

DR. NAUMANN: Bob, I should like to ask this question. What are the opportunities for the four-year graduates in your department of products and development?

MR. BURRELL: Well, I can make it long or I can make it short. In our company (I know you are all familiar with it) we have a sales manager for the products division. We have a provisions manager for the products division. We have a production superintendent for the products division. And we have a research technician or a meats scientists for the products division. These four are a committee that represents the development work, the research work, production work, provision work in that products area. We currently have men, four-year graduates from your school and other schools represented here, who are responsible for that products division.

They work with the production men in the plant. They work in the research pilot plant preparing products, studying different types of operations, applying research that comes from publications and some that comes out of our own small research effort. Their opportunity is in that area. Then when they become experienced, but we haven't gotten that far (we are only two years into the program) we will rotate them from one product division to another which will broaden their knowledge of the plant.

As these fellows are looked at by the people in the company they are plucked out, and we have already lost three or four of our very best men to various types of operations and they have been moved up in the organization to other echelons. We are getting their creativeness for research and development. We are training them in a broad base manner so that they are of value for management opportunities later, if they wish them.

DR. SCHULTZ: The University of California, in their food technology department, has used a scheme that may apply to something that Mr. Burrell has indicated here. They recognize, too, that in the food industry as a whole there is need for more engineers and people with a background of engineering training, but they haven't been able to induce engineering schools to put foods into their curricula. It would mean another year probably. So it was proposed there in a plan which they have adopted, but it really has not had time to develop yet, to choose engineers who are planning to go into the food field. They have completed their B.S. degree in engineering, maybe chemical engineering, and then they come over to the food technology department for one year, and are given certain courses there and learn something about the food industry and the applications of engineering there.

The same thing in principle might be applied as far as meats are concerned, where you get your engineers who want to go into the meats

industry. Bring them into the meats department for a period of time -- maybe one year -- and give them that additional training there on top of their engineering. It will not disturb their curriculum at all, and you could give them another bachelor's degree after the one year period which would be an attraction, too.

It might apply in chemistry also, if you want to pick a chemist out who has a bachelor's degree in chemistry. Then bring him into meats or in our case it would be food technology. He gets another degree and is qualified then to take on this more specialized work.

DR. KUNKLE: Are there other questions?

If not, I should like to unburden myself with a little personnel problem. Last year, you will remember, the Personnel Committee launched a plan to try to do something to help each other to see if we could not find jobs for students, and so we published this. Perhaps this is my way of sharing with your Executive Committee Chairman the fact that I was not very observant for on the very first page we have an error. We have spelled "livestock" as one word and the Board prefers to make two words out of it.

Then when we sent you these requests we discovered that we had six pages of Ditto material which I am asking Dr. Blumer to share with you so that you will see what has happened. If you will do that, Tom, just get them out on the tables, I should like to try to explain to you that the original plan provided for this supplement and then in even numbered years we would reprint it in order to bring it all together in one package.

I had visions when we sent you these simple sheets that probably we could put all the errors and all the new names on one erratum sheet or addendum sheet or supplement and simply stuff it in the mail for you or bring it here and deliver it. But when it took six pages then we began to think about what else to do, and the committee, which is composed of Dr. Doty, Professor Loefel, Dr. Ellis, and myself, has gone to the Board, Ken Franklin in particular, with the proposition that we think perhaps it is worthy to try to improve upon the whole situation.

While you are getting these I might just try to explain, so that all of you don't become alarmed, that we tried to list the name, the resident, the birthplace and date, the degree, the college attended, year, employment experience, current responsibility, and finally your primary meat interest. We listed them alphabetically by institutions, ignoring in the case of the university coming first, because we thought the state was the easy way for everyone to find his place in the directory. So we start off with California State Polytech and Clemson. One of the first changes that arrived was when friend Hazaleus said it was no longer Colorado A. and M. College. But, you remember, he has already shared the new name. So that is the reason we have a college name change the very first thing.

Now we are listed just exactly the way we are listed in this directory which contains the 120 names, except that there were three or

four late arrivals and so they had to be tacked on to pages 5 and 6. You don't need to look back there now to see who was late. I didn't mean that. (Laughter)

I ought to say that there are 71 name changes on this Ditto copy that we have listed for good reasons. Twenty-one of them are new people who have been included. Several of the changes were more important. For example, one fellow changed his birthplace and his birth date, too, on us. (Laughter)

The most embarrassing error, of course, after the National Live Stock and Meat Board identification on the cover page was to miss the correct initial of the Secretary-General Manager of the National Live Stock and Meat Board.

Now the question that must be raised with you is what shall be done with these six pages of additions and corrections? Your committee has conferred with Ken Franklin, of the Board, and wishes to present this committee recommendation, Mr. Chairman; namely.

That the Personnel Committee of 1956-57 reprint the Reciprocal Meat Conference Personnel Directory, parenthetically as soon as possible.

a. To be composed of the names originally listed as correct or as altered on the Ditto addendum now distributed among you.

b. Institutions to be listed alphabetically by proper name or by state.

c. Representatives of each state are qualified by having direct contact with meat and performing functions of teaching, research and/or supervision.

Then under that we would say:

1. Graduate students who have completed one academic year will be included.

2. Men to retire or who are now enjoying emeritus status from their respective meat sections will also be listed.

Mr. Chairman, I move the adoption of this recommendation.

CHAIRMAN BLUMER: Thank you, Larry.

It has been moved and seconded that this motion be adopted. All those in favor of adopting the motion signify by saying aye; opposed by the same sign. The motion is carried.

Thank you very much, Larry. Is there something more that you would like to add?

DR. KUNKLE: At the risk of an anti-climax I should like to ask that any of you who find an error contact me. I know that there are

four or five things in this that have to be changed and I will take care of them. But will the rest of you be responsible as committees of one if you find errors to see me, please, between now and the banquet time, and then when I get home in the morning we will go right to work and see if we cannot get this into print. If you will, please, thank you very much.

CHAIRMAN BLUMER: Thank you very much, Larry. And thank you, Mr. Burrell, for a very informative presentation. I am sure that we are all very grateful to Larry Kunkle for the time and work that he has put on the personnel directory. My directory is very dog-eared looking. We used it a lot in the preparation of this year's program. If for no other reason, I think it would be worth the work of getting it together, although I don't know if Larry would agree with me or not.

We will go on with the program, the Meat Publication Fact Finding Committee, the chairman of which is Dr. A. M. Pearson. Dr. Pearson. (Applause)

DR. A. M. PEARSON: We will ask the members of the committee to come forward please, and that will help in the saving of time, those who are taking part on the program.

Our part on the program is entitled, "Do we want a meat publication?" The first paper dealing with this is a summary of the meat publication survey which we conducted during the past year. This topic will be discussed by Dr. George Wellington, of Cornell. George.

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SUMMARY OF MEAT PUBLICATION FACT FINDING QUESTIONNAIRE

G. N. WELLINGTON

CORNELL UNIVERSITY

Total number of questionnaire forms returned: 108

Response to specific questions

1. a. How many scientific papers did you or others in your organization publish in 1956? (Based on 102 responses due to 6 duplications).

None	One paper	Two papers	Three papers	Four papers	Five or more papers
58	17	4	6	7	10

Total number of papers published by persons returning questionnaire: 142

b. How many total pages? (Based on 102 responses due to 6 duplications).

None	One to five pages	Six to ten pages	Eleven to twenty pages	Twenty-one to thirty pages	Thirty-one to forty pages	Forty-one or more pages
58	8	14	10	4	4	4

Total number of pages published: 898

2. a. How many papers do you estimate you or others in your organization will publish each year for the next three years? (Based on 103 responses due to 5 duplications).

None	1/2 to five papers	Six to ten papers	Eleven or more papers
33	59	10	1

Total papers estimated to be published each year for the next three years: 245

b. How many pages per year? (Based on 103 responses due to 5 duplications).

None	One to ten pages	Eleven to twenty pages	Twenty-one to thirty pages	Thirty-one to forty pages	Forty-one or more pages
33	34	19	10	1	6

Total number of pages estimated per year: 1198

3. a. If a good scientific periodical were available in the field of meats, how many papers would you be likely to publish in such a journal per year?

None	Undecided	One paper	Two to three papers	Four to six papers
29	6	46	23	4

Total number of papers likely to be published per year: 115

b. How many pages per year?

None	One to three pages	Four to six pages	Seven to ten pages	Eleven to twenty pages	Twenty-one to forty pages	Forty-one or more pages
35	10	30	19	11	2	1

Total pages to be published per year: 597

4. a. If a new periodical were published in the field of meats, would you subscribe to it?

Yes: 94

No: 6

Unanswered: 8

b. How many subscriptions would you estimate from your organization or institution? (Based on 80 predictions due to 28 apparent duplications of estimates from the same organization or institution).

None	One subscription	Two to five subscriptions	Six to ten subscriptions	Eleven to fifteen subscriptions
20	13	41	5	1

Total estimated number of subscriptions: 199

I was completely unprepared for the size of the conference this year; so if you can share the copies of this survey, I am sure there will be one copy for each two people at least.

The name of this committee pretty well described its function, and as far as the interpretation of the results of the survey are concerned, I believe that you are going to be just as well qualified to interpret them as I am. Our good Chairman was responsible for sending out this survey, and I will just briefly run through the summary that we have gotten from it.

One hundred and eight surveys were returned. We hope to stick to facts rather than feelings as we report these things to you. We learned from the survey that 142 papers were published (you will find that under 1. a.) last year. We learned that we are a very optimistic, hard working group of people this current year because we are going to publish 245 papers this year against 142 last year. Last year we published practically 900 pages, and over the next three-year period on a per year basis we expect to publish about 1200 pages a year. I think it is good that we are optimistic. We must be working a lot harder this year, too.

Turning over the page I am not going to go through the details as to the way we group this, merely referring to the summaries.

"If a good scientific periodical were available in the field of meats, how many papers would you be likely to publish in such a journal per year?" We anticipated that some of us are likely now publishing in other journals. We would likely support a new journal of our own. There would likely be some of us who would have papers that we would want to publish in existing journals. So we put this question 3. a. in, and the total number of pages likely to be published per year as indicated on the survey was 115. As to pages per year, it was roughly 600.

Of course, we are interested in subscriptions and the possible total circulation and Al Pearson is going to go into that in more detail in his report that follows.

Question No. 4 merely asked the person receiving the survey whether he would subscribe to it or not. Six said no, 8 were undecided, and 94 said yes.

In question r. b. we asked them to make an estimation of other people at their institution or organization that might subscribe to the journal, and they indicated that there would be about 200.

As to what people were included in this survey, of course, it went to all the members of the reciprocal meat conference; it went to the home economists at the various land grant colleges; to food technologists. In some instances it went to the animal husbandrymen who are responsible for the meats work at the institutions being institutions where they did not have regular meats departments. It went to members of the packing industry, being sent, of course, to those addresses that the committee knew about and felt that they could get a response from that was meaningful.

On the survey sheet there was opportunity for listing of comments, favorable or otherwise, if the responder wanted to make comments. Only 28 comments were returned, and I am not going to go through them in detail. Twelve comments of the 28 were definitely favorable comments. Ten that I would classify as unfavorable. Six that I would classify as undecided.

A few little thoughts did come out of these comments, in that home economists working in the western part of the country mentioned that at the present time there is really no good journal to publish consumer preference studies in and asked the question whether this might not be a better place to publish such kinds of studies than we now have.

One of our more active meats departments, I would say, that is represented here, raised the question as a group whether the committee might consider a mimeographed series which could be quickly done as a news exchange rather than a new publication, assuming that the standards would be high in English composition, concise expression, and be comparable to a publication in that respect.

Other than that it would be very difficult to generalize on the comments that were listed, because, as I mentioned, there were not a great many comments.

So again sticking to facts rather than feelings, I am going to turn it back to you, Al.

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DR. PEARSON: Thank you, George. We appreciate your summary concerning our request going to you as individuals to find out your wishes in this regard.

I am now going to talk about "Some Facts and Figures on Costs of Publishing a Meats Journal.

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SOME FACTS AND FIGURES ON COSTS OF PUBLISHING A MEATS JOURNAL

A. M. PEARSON

MICHIGAN STATE UNIVERSITY

The primary function of the Meat Publication Fact Finding Committee is to determine the feasibility of publishing a scientific periodical in the field of meats. Thus, this assignment has entailed determination of the costs involved in publishing such a periodical and an investigation of the experiences of other similar periodicals in the scientific field. Dr. Wellington has presented a summary of the questionnaires to the membership on the number of subscriptions and the availability of journal articles to support such a publication.

Before giving actual estimates on costs of publishing, let us set up certain minimum specifications which would need to meet before a meats publication would be a sound undertaking. The minimum number of copies for each issue would be 500, which could include a minimum reprint order of 200 copies. Thus a minimum of 300 subscriptions would be needed. Although the questionnaire does not indicate this large a circulation, it appears that there would be considerably more subscribers than the response would show. I say this in view of the fact that institutions, libraries, Home Economics Departments, other cooperating departments, and meat packers as a group were not contacted by the questionnaire. Furthermore, other scientific journals sell about 50 percent of their subscriptions to non-member personnel.

Frequency of publication is another problem to be considered in initiating a journal. Certainly the usefulness of any journal demands frequent publication with a rather small back-log of manuscripts, which in essence means relatively fast publication policies. I am taking the liberty of defining fast publication as publication within 6 months of the date the manuscript is received by the Editor. Thus the minimum frequency of publication would need be quarterly in able to meet demands for relatively fast publishing. This would mean an article could be received by the Editor, reviewed by the Editorial Committee and revised by the author if necessary and still be published within 6 months.

This brings us to the major problem in publishing a journal -- that of financing. The experiences of other new journals in financing publication show additional funds are frequently needed to meet costs. This can be done either in the form of sale of advertising space or by financial support from other sources, such as backing by some organization or group.

To be more exact, let us examine the financial statement of two journals published by the same organization -- Food Technology and Food Research.

	Food Technology	Food Research
Total pages per volume	1276	808
Number of journals (approx.)	5700	2200
Mfg. cost per issue page	$43.50	$17.85
Mfg. cost per copy	.81	1.09
Advertising income	73,946.28	612.50
Net gain or loss	$11,893.84	-$1,145.70

This information gives some idea as to the financial status of two journals. You will, no doubt, note how advertising made the one journal a successful financial venture but Food Research lost money during this period. Thus, you can see the possibility exists that paid advertising could be used as a means of helping to defray publication expenses. However, such a decision need be made only if it is decided that publication of a meats journal is desirable and feasible.

You will note costs of publication for the previously mentioned journals amounted to about $1.00 per issue copy. However, circulation was at a somewhat higher level than could be expected for a meats periodical. Based on estimates from a number of publishers at a 500 copy minimum order per issue, it would cost about $1.50 per issue or $6.00 per subscription for a journal of 100 pages published quarterly. I am of the opinion that on such a basis a journal would approach being self-supporting. However, the possibility of going in the red is apparent from studying other journals experiences. Thus we have contacted Mr. Carl Neumann of the National Live Stock and Meat Board relative to underwriting such a venture, if the Reciprocal Meat Conference decides to undertake publication of a meats journal. In the event the Conference should decide to publish a journal, Mr. Neumann has agreed to take a written proposal of the group to the Board. Thus, we can be reasonably sure that we can count on their financial support.

In conclusion, we have given you few facts and figures on a new meat publication. Although they are not complete and at best an estimate, I believe that the picture looks encouraging if the membership of the Reciprocal Meat Conference is interested in supporting such a journal.

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DR. PEARSON: Now, without further ado, we will give you the case of the pros and cons of a meat publication. Woodie Annan will act as moderator for this discusstion and will introduce the speakers. Woodie.

MODERATOR AUNAN: Thank you, Al.

Members of the Conference: I have the pleasure of introducing to you two barristers who are going to be engaged in the pros and cons of this question that we have before us. On my left, Ed Kline of Iowa State, who will come forth and give us the cons connected with the publication of a meat publication.

DR. KLINE: I may be a con after this. You will probably find a tinge of the pro in some of the comments that I will present. I haven't quite fully decided why I was selected to give the case against a meat publication. I think that our able Chairman had a little motive in picking the two speakers here this afternoon.

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THE CASE AGAINST A MEAT PUBLICATION

E. A. KLINE

IOWA STATE COLLEGE

For the past two or three years there has been considerable discussion regarding the possibilities of having a meats journal or periodical. This year your executive committee appointed a committee to study the possibility or feasibility of our group undertaking the sponsorship of such a publication.

Although I am heartily in favor of such a publication, I would like to mention and point out some of the objectives of our group undertaking a project of this nature.

First of all, if such a publication were undertaken it would certainly require the full cooperation of every one of us here. I would like to cite the example of our project on abstracting meat publications. Our success in this field has not been fully achieved because there have been people in our group who have been negligent in their assignment. It is far too easy to say that we will let somebody else do the work for us. The success of this periodical rests on the shoulders of all of us.

Secondly, I would like to point out that at the present time we have available several periodicals which publish meat research papers and all of these have a much wider circulation than we might expect of a meat publication, at least for the first few years. However, I am sure that it would be the wish of all of us that if this project were undertaken the quality of the periodical would be such to merit a wide distribution, at least after the first few issues.

Also I would like to point out that by reading several different publications in search of reports on meat investigations, one is able to keep a little more abreast with the time and a little more up-to-date in fields of other endeavor.

Another question we need to ask ourselves is would we be willing to submit our results to a journal or paper with only a few hundred copies circulation instead of to a publication which has perhaps several thousand copies circulation.

Thirdly, a new publication will necessitate an editorial staff. Do we have within our group people who would be willing and have the time to serve as an editorial committee for a publication? Here again it's going to take the time of several individuals to make a success of a new journal or periodical. The last point I would like to mention is one regarding subscription costs or costs of a new journal. Here again I think we need to seriously consider whether or not our group would be able to publish a

periodical which would have the subscription costs in line with the cost of other periodicals. As Dr. Pearson has pointed out, it costs a considerable amount of money to publish a respectable journal and with a limited circulation will it be possible to keep these subscription costs in line with the wishes of the entire group?

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MODERATOR AUNAN: Thank you, Ed, for your good remarks concerning the case against any publication.

Bill Sulzbacher is going to have something to say with regard to the ideas around why we should have or what are the advantages of a meat publication.

DR. W. L. SULZBACHER: Thank you, Woodie.

President Eisenhower said a few years ago that moderation is the spirit of the times, and I don't know what our Chairman's politics are but evidently he follows Mr. Eisenhower in feeling that this is an age of moderation. I would imagine that an effort has been made to moderate Ed Kline and Bill Sulzbacher at least in the assignment of the topic. So here I am, quite contrary to last year's conference, telling you why a publication would be a good thing. (Laughter)

The proceedings of this conference have been coming more and more into use in literature citations. I notice that people are quoting things that various ones of us have said, particularly the different methods that we have published in the proceedings, and it is a little difficult, outside of our own institutions, to find a copy of these proceedings. If we had a regular publication it is very likely that these things would be available in libraries, as are other journals, and this would make a bit stronger the usefulness of those things that we accomplish here at the conference.

Likewise it seems to me that this abstracting effort that we are already in (incidentally, it seems to me that if we cannot take care of that publication effort how are we going to take care of a new one) but maybe some of these abstracts or all of these abstracts could appear first in the journal and then later on could be distributed on the punch cards and that would mean that a portion of the journal would have abstracts. You see, I am just sort of dreaming here what this might be like. The old Zentralblatter that was published in Germany had one part abstracts and the other part original articles. That would get these abstracts out into the field and I think they would be very useful.

Since I had a darned hard time thinking what the good of such a publication was, I had a meeting at Beltsville on Friday morning, and I said, "Ladies and gentlemen, I have to go to Chicago next week and tell the people there why we should have a meat publication. Now it is up to you to tell me."

That is about the only suggestion that anyone gave me that I thought was a really good one. One of our fellows, Morris Berman, said that he was impressed with the great usefulness of that little journal of food abstracts and he thought that we ought to have something like it in this country. Of course, I said to him that we already have the British Food Abstracts, so why do it again. But I thought that might be one place where it might be useful.

Also as George Wellington pointed out, this would provide a better climate for certain papers. I am thinking particularly of review papers and monographs. Of course, I don't know of anyone who is preparing any such paper in the meat field. I have not seen any yet. Well, I do know one who is preparing one, but that is only one.

I think if there were a journal that would accept review papers, say, on the literature background of meat freezing that would be a very useful paper. I should like to have such a thing. Of course, such a paper could now be published in certain existing publications, but there are a good many places where there just isn't a good place. For example, subjects dealing particularly with animal husbandry research of a meats nature. The Journal of Animal Science is pretty crowded and I don't think there is room for monographs or long review papers. Maybe our new journal might publish them.

The question of where consumer surveys might be published has been suggested. I must admit that this might be a possibility. However, I also noticed that at this year's IFT meeting a whole day was given to papers and round table discussion of consumer preference and preference panel work. So that I presume those papers will be published in Food Technology or Food Research, and that will more or less advertise to the world that Peterson is waiting for any more papers of that sort.

We would have as individuals, if we supported this new journal, a friendly atmosphere in which to publish. I think that is the thing that was behind the thoughts of many people when this thing came up last year. That is, there is a kind of undercurrent of feeling that there may be just a little hesitancy here and there to accept a paper from a meats man as opposed to some other kind of worker and we would be assured that these papers would be reviewed by meats men; that they would get a sort of friendly criticism at least in the sense that the people on the editorial board would speak the same language that we speak and they would understand the problems that we have.

Last of all, I feel that this would be a good place to publish various sorts of news items. The Personnel Committee would be able to publish announcements of job openings, announcements of changes in location and title, and we would not have to wait until the reciprocal meat conference came along to learn, for example, that Ken Warner had become a professor or something of that sort. It could be announced in the journal.

So these things that I have said are what appear to me to be the good reasons in favor of such a publication.

I hope that the spirit of moderation won't prevail too long and we will have a chance to bat it around on the floor in good old reciprocal uninhibited style and everybody say just what he feels. (Applause)

MODERATOR AUNAN: Thank you, Bill.

Now you know why everyone has mixed emotions up here at this table.

In order to conserve time and to let us go ahead in the style that Bill proposed I am going to turn the meeting back to our conference chairman, so that we can get going.

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CHAIRMAN BLUMER: You have heard the pros and the cons of this meat publication from the Fact Finding Committee, both opinion and fact, and you can separate the two in your own minds. I think we should remember as we discuss this that part of this is opinion and part of it is fact. Try to separate the two and give us your opinion. Remember, it is opinion and the other fellow is entitled to his. So what is your preference?

DR. SCHULTZ: I think it should be recognized that societies that sponsor journals of various kinds have ownership of the papers for publication given at their various meetings. This is true of the American Chemical Society and the Institute of Food Technologists. The papers are published in their journals unless they are released or discarded as not suitable for publication. I wonder then if consideration was given to publishing the proceedings of the conference in such a journal.

CHAIRMAN BLUMER: Al, do you want to answer that question?

DR. PEARSON: We never considered the possibility of that, although I assume it would be possible. We have not tried to determine what would be published and what would not be published. We were strictly investigating the feasibility of such a publication.

DR. SCHULTZ: Well, it would increase the size.

DR. PEARSON: It would increase the size, there is no question about that.

DR. SULZBACHER: Tom, could I say a word just as an individual member of the conference now? (Laughter)

What I had reference to, Dr. Schultz, in speaking on the positive side of this is that there are certain things now appearing in the proceedings that could very well appear in the journal and would greatly strengthen such a journal.

This matter of whether or not there is a place for meat papers today is one that has concerned me quite a bit. Naturally out of our group we have a good many papers coming each year. I talked this over with Gaddis the other day. He and I have been in the meat section for

about 12 years, and we have seen quite a few papers come out. We could not remember any paper that ever ran into any difficulty. I don't think mnay of you have had any such experience.

Furthermore, I counted the papers in Food Technology in 1949. That was the first year in which Food Technology was published in its present format. There were 7 meat papers that year. In 1956 there were 18 papers that I could say for sure were meat papers and no one would argue with me, and there were 4 to 6 papers that had a lot to do with meat and you could, if you wanted to, count them as meat papers. So there were anywhere from 18 to 22 papers, dependent on how you counted them. So that with the increase in papers the journals have been willing to expand in size and to take on new papers.

It seems to me that in the future a higher percentage of our papers will go toward food technology because meat technology is coming very much to the fore-front. Just a comparison of the reciprocal meat conference program, say, of 1949 and of 1957 will show the increase of emphasis on meat technology in our thinking. I very strongly believe that most of us will want to publish these papers dealing with meat technology in a technology journal because it will have a very wide circulation. As Al pointed out, the number of copies of Food Technology is now approximately 6,000 and that is a whole lot different from 500 when you are thinking about who is going to read your paper.

CHAIRMAN BLUMER: Thank you, Bill. Who else would like to express an opinion?

DR. DEATHERAGE: I should like to second what Harold Schultz had to say because actually most of the meat publications are not permitted to be published elsewhere. In other words, this conference does not make a business of research papers. Where are you going to get these papers? The American Chemical Society and Food Technology both have complete title to their papers. The resumé that I gave yesterday, every one of those things is copyrighted that I showed on the screen. The conference here can't even reproduce them without getting permission for publication. You may say that is restraint of trade or whatever you wnat, but it is just a matter of self-preservation.

I might say that I know a little about the trials and tribulations of another journal that has, we might say, a considerable amount of capital behind it. That happens to be the Journal of Agricultural and Food Chemistry. It tried to cover too much of the waterfront -- people who wanted to furnish fertilizers and insecticides with meat. It just didn't have any common front. It was agreed that they would underwrite it for four years, and it still isn't anywhere near profitable or even paying for itself.

There is only one journal that I know that is strictly meats, and that is Die Fleischwirtschaft which is a German journal and actually is a combination of what we would call the provision of food technology.

CHAIRMAN BLUMER: Thank you, Fred.

I guess there is the first time for everything, perhaps.

DR. WILSON: I would just like to raise this question. I think it is something that needs very serious consideration. In looking over the response to the questionnaire that was sent out, I believe the summary to my way of thinking took a very optimistic view. If we look at the other side of the fence, the total number of papers published in 1956 is 142. I think that is the figure that we should look at rather the number that say they will publish. There is quite a difference.

In filling out the questionnaire I had the task of summarizing the one at the Foundation, and I can speak for myself personally. We have data for about three papers the publication of which has not been started. Well, perhaps I am as guilty as anyone else. I should like to publish them in the next three years and they are included here, but whether they get published or not is a horse of a different color. So my point here is that I think we should be looking at this 142 figure rather than the 245 which, in getting down to the total number of pages that would be published, is quite different than originally summarized.

CHAIRMAN BLUMER: Thank you, George. Who else has a comment?

DR. WELLINGTON: Just to follow up what George has said, actually over on page 2 our group said that 115 papers would be published in our journal which are a few less than the 142.

CHAIRMAN BLUMER: I think that we should give the chairman of the committee an opportunity to assume the chair again for any comments that he may wish to make, in view of the comments from the floor.

DR. PEARSON: First of all, in rebuttal to what George has said, I think if we will note the number of pages we are less optimistic about the number of pages. It is 900 versus 1100 which is only an increase of 200 pages in comparison with the number of articles. Apparently people are also going to be less longwinded next year in writing their articles.

I think that is a decision the entire conference has to make. We need to hear both sides of the story and we have tried to give it to you this afternoon. I think that there are definitely some advantages and there are some disadvantages, and I think it is up to the conference to make the decision.

One of the objections that was raised was whether members of our group would be willing to act as an editorial board and editor. I have a statement from Jerry Wanderstock to the effect that he will be willing to act as editor if he is asked. I think you know that Jerry has done a very excellent job in the past and he would be willing to serve as editor if the conference should decide to do so. (Applause) I think that Jerry is to be commended on his willingness to serve in this capacity if we should decide to undertake such a publication.

As I said, we are not trying to put this across unless the conference is willing but I think it boils down to: If we want a publication

now is the time. I know that as a committee we don't want to go through next year again investigating the possibility. So far as we are concerned, we have given you the facts, and I think that as far as we are concerned it is now or you wait 10 or 20 years and then decide again whether you want to have one. I certainly don't want to be on a meat publication fact-finding committee again in the next 10 years.

So certainly we will leave it with that, and at this time I should like to move with consideration of this, that as a conference we undertake such a meat publication.

DR. KLINE: I second the motion.

CHAIRMAN BLUMER: Thank you, Al.

The motion has been made and seconded that we accept the Meat Publication Fact-Finding Committee's report. It has been seconded that we accept it. All those in favor of attempting to promote such a publication raise your right hands; opposed the same sign. A lot of people are not voting.

DR. KEMP: What was the motion that Al made?

CHAIRMAN BLUMER: The motion was that we undertake to publish a meat research journal.

DR. KUNKLE: The suggestion was made that a mimeographed affair might be considered.

DR. PEARSON: Whatever they do about it, I think that is up to whoever might be the board.

CHAIRMAN BLUMER: In essence that is the motion. That is, do we or don't we? You have heard the facts presented on both sides and I think no more discussion is warranted.

DR. MACKINTOSH: In making the motion did you have in mind that the Meat Board might underwite it? Are we not being a little presumptuous in acting on that assumption until it has been presented to the Board?

CHAIRMAN BLUMER: Well, the idea has already been presented to the Board, and I think maybe Ken Franklin would like to make a remark.

DR. MACKINTOSH: I think we ought to have it at this time.

SECRETARY-TREASURER FRANKLIN: No, Davie, in answer to your question, I don't think this is presumptuous. As Tom stated, Mr. Neumann has been approached, and he said that he would be willing to take to the Board of Directors a written proposal of the conference with respect to publishing a journal. Now let's boil that down. What he is saying is that if you folks vote that you want a journal and that you have a well executed plan and you will present that in writing to him, he will take

it to the Board of Directors who must make the decision whether or not to underwrite it financially.

I think that I should clarify the statement as to underwriting it financially. To the best of our knowledge that would mean that the publication would receive financial backing until it was able to get on its feet or it went bankrupt, and if it went bankrupt it would go bankrupt awfully fast. Is that clear? That is the extent of the agreement with Mr. Neumann and that is what Tom intended to convey; that we are sympathetic to the idea providing it is the will of the conference and it is well planned.

CHAIRMAN BLUMER: Does everyone understand the motion now and are we satisfied without further discussion? Does anyone wish to offer an amendment to the original motion which might clarify it for some of you? Well, let's have a recount then on that motion as I think you now understand it. All those in favor of the motion raise their right hand. It is somewhere between 20 and 22. Maybe we can resolve that. All those opposed raise their right hand.

SECRETARY-TREASURER FRANKLIN: I got 26.

CHAIRMAN BLUMER: I got 25. So the motion is defeated.

DR. PALMER: Mr. Chairman, I think that there is considerable reluctance on this thing on the basis that we just don't know or we think we don't know how much we could do or the mechanics of it. I wonder what it would be like just to try it for a year experimentally. I know that it would be a lot of work for somebody and it might be for nothing.

SECRETARY-TREASURER FRANKLIN: May I answer that, Mr. Chairman, in the light of what I have said? I don't think (and I am speaking for Mr. Neumann now) that a vote as close as we have seen indicates the strength of the will of the conference that we would like to see. I don't think the venture would survive, if your present thinking continues with a split conference, which is just about what the vote reflects.

DR. PALMER: My point was if the group thought it needed something to help it to jell its thinking so that it could be more decided. As for myself I voted yes, but I am not completely decided, and it is just a kind of alternative that we might kind of mull around. It would be a compromise. You want either to do it or not to do it, I know.

SECRETARY-TREASURER FRANKLIN: Perhaps I did not make myself clear. I do not believe the Board would underwrite it on that kind of a basis.

CHAIRMAN BLUMER: I think the conference must abide by the majority, and the majority is against the publication; therefore unless we have new evidence to the contrary, I think the motion to have a research journal has been defeated fairly and squarely.

MR. RUST: Tom, I have one question. I wonder if this were presented by the committee in a more concrete form, in terms of editorial

policy, and so on, whether the people might not be able to make up their minds. I notice from the vote that probably almost half of our members abstained. I think there is a good deal of doubt.

I wonder if possibly it might not be a good idea for the conference either to use the existing committee or a new committee to spell out the journal as to its editorial policy and what its completed form would be and resubmit it to the conference at another time, at the next meeting or else by ballot at some time during the year.

CHAIRMAN BLUMER: Thank you, Bob.

DR. KELLY: That is much the same thing I have, Tom. I didn't vote because I don't really feel qualified to say one way or the other. I have a lot of questions that I should like to have answered as to the criteria that papers would have to fall under to get into the publication, whether or not the proceedings would be a part of it, and whether or not there would be an abstract service along with it. I just have too many reservations to vote intelligently on this issue. It may be that we have a crying need for it, but I don't feel it right now.

DR. SCHULTZ: If I interpret the feeling of the group here it is that the time isn't ripe, and that in three to five years from now the situation might change. I would, therefore, move that the committee file a report with the Secretary and that it be brought up for review in 1960.

DR. KUNKLE: You have the report, sir.

CHAIRMAN BLUMER: You have heard the motion. Is there a second?

DR. WELLINGTON: Second.

CHAIRMAN BLUMER: We have a motion before the house.

DR. NAUMANN: I should like to say that I feel that this motion is not definitive enough and I would explain it in this way: The one reason I voted against the publication was because I think that the report that was presented just now did not clearly enough establish the responsibilities of the Board: How much it would cost them. How much they would be obligated by the publication. Although the motion as stated has some merit, I think its usefulness is limited in that in effect the committee will file this report, as I understand it, and that will be it until 1960. I would favor a motion that would instruct the committee to do something more definite than just to file the report.

DR. PEARSON: Mr. Chairman, I don't think that the committee wants to function under that basis at all. First of all, I don't think we are in a position to determine such things. I think that is the power of the conference, or of a committee that would be appointed by the conference specifically to determine editorial policy. That was not our consideration. It was whether or not it was feasible. We attacked it from that standpoint, and I think we presented the data and that the

conference voted it down. As far as I am concerned, I think that the committee has completed its assignment.

DR. SULZBACHER: I should like to say a word in consideration of Dr. Schultz's motion. I think basically this is a good motion. Of course, the committee has filed its report. This constitutes our report, and it will be a part of the proceedings and in the future it can be read.

The main reason I have been so outspoken in being opposed to a journal is that I don't honestly feel there is a need for a journal. If a need should develop in the next three to five years than I would be just as outspoken in favor of a journal as I am today opposed to it.

I think that the second consideration we have to think about is that the journals that exist in this country (and they are mostly large journals as opposed to the small European journals) are published by large national societies that have large memberships and, therefore, a certain amount of financial flexibility that we don't have and, of course, we are looking toward a sort of godfather in the Meat Board to act in that fashion.

It has long been my hope that this conference would develop some greater solidarity than it has now. For instance, I became aware this afternoon that one of the men who came here from the Department for the first time is not exactly a member of the conference. There is a little question. Is he just here or is he a member? I mean, we need to have a definite membership. We need to know exactly who we are. We need to know just where we stand. And mostly we need to stand a little on our own feet, and certainly if we are ever going to publish a journal we are going to have to have pretty good feet to stand on.

But I think there is merit in Dr. Schultz's suggestion that at least we do not forget all about this and that possibly another committee should be appointed at some time in the future to look into the situation again.

CHAIRMAN BLUMER: We still have a motion before the house. The question has been called for. All those in favor of the motion signify by saying aye; opposed by the same sign. The ayes have it.

SECRETARY-TREASURER FRANKLIN: Dr. Blumer, I should like to make a comment, since we are talking about publications. Fred Deatherage just a few minutes ago brought up a very good point, and I did not feel that it was pertinent to the discussion to comment on it at that time but I should like to now. Fred mentioned that he had presented material which had been copyrighted and published. He also mentioned (and I am quite sure that he is right) that this material cannot be published in the proceedings without the permission of the publisher. That is quite correct. However, had not Fred mentioned that, the Board would not have known it. I do not know what other material falls under the same category. But I think you can understand that the Board does not want to be put into the position, knowingly or unknowingly, of publishing copyrighted material without that being indicated and without a release.

Now it is my opinion that material that is presented to this conference with the understanding that it is to be published in the proceedings should be cleared with the proper authorities, if that is necessary, or it should not be submitted. I throw that out for discussion because I know of no other way to settle our position. We don't know from the material that comes in where it has been published necessarily. What is your opinion on it?

CHAIRMAN BLUMER: What is the opinion of the group?

DR. PEARSON: It seems to me that any author who is presenting something here should be obliged to obtain clearance on it. For example, if Fred is presenting something, he may not even have presented anything. What he has given here may be all right. He may not have it in his written articles. But I think it would be up to him to get clearance on it himself.

DR. DEATHERAGE: Well, if I redrew all the drawings I suppose they would not be copyrighted any more. I just don't have time to redraw all those things. It is not my obligation as an author to do that. It is the publisher's obligation to get release from those who copyrighted it in the first place. In other words, are you asking me to write to the U. S. Patent Office and get releases on those charts that I showed there? I have no authority to ask for those releases. The National Live Stock and Meat Board that will publish it is the only agency that is involved. In other words, it is actually its responsibility and not the author's.

I hesitated to bring this up and I purposely did not leave any prints of the slides that I showed here, simply because I knew that all twenty some slides had been copyrighted by one journal or another. I could not act as an agent for the National Live Stock and Meat Board. I am sorry but I am not the qualified person to ask for a release.

CHAIRMAN BLUMER: Thank you, Fred. It seems to me that a way around this then is we have had a recording secretary and having the record I presume it could be published. If it is published elsewhere I think permission could be obtained from the journal because it is not word for word. As long as you changed the wording, and I assume it must have been changed since it was a verbal presentation, I don't see where we would run into any complication. However, if it is a matter of copying the exact data or tables, then it would be necessary to secure the permission of the various journals, patents or whatever it might be.

MR. KEAN: The proceedings are not for sale in any place. I am not too sure that it would come under that copyright. Only the list of members here. I think these copyrights pertain principally to the sale of articles.

DR. SULZBACHER: Mr. Chairman, we are making a great many legal assumptions that we are unqualified to make. A copyright is a very complicated thing, and we are not going to settle it authoritatively here by discussing it.

I should like to say that we have had occasion frequently to ask journals if we could use certain material that they had published in other articles or other releases and I know of many other people who have done the same thing and permission has never been refused.

I think the only onus here is that each person when presenting such material should inform Ken Franklin that such releases must be obtained.

DR. PALMER: Mr. Chairman, I move that Dr. Deatherage obtain a release from his journal so that it can be included here.

SECRETARY-TREASURER FRANKLIN: Fred, we don't want you to act as our agent. If it is a matter of securing permission, the Board will be happy to do so. We appreciate your letting us know in this instance because it is the first time it has come up. We want to clarify the situation and to use it, as you have done, as an example in point. As Bill Sulzbacher remarked, if we are notified of copyrighted material and the publication by which it is copyrighted, we will write for permission. But we must be notified.

DR. DEATHERAGE: Mr. Chairman, I think you will recall that I pointed this out to you yesterday, and I don't know of any instances where releases have not been given, but I cannot ask for it. The publisher has to get the release. I can tell the National Live Stock and Meat Board where everyone of these occur, and they can certainly get the release.

CHAIRMAN BLUMER: Well, we have come to the end of the road. I believe, except for the business session. The first item in the business session is the report of the Resolutions Committee, and I will turn the floor over to Coleman O'Brien, Chairman of the Committee.

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MR. COLEMAN O'BRIEN (Texas Tech. College): Thank you, Mr. Chairman.

I will proceed with the resolutions.

Mr. Chairman, would you prefer these to be presented singly or as a group?

CHAIRMAN BLUMER: As a group.

MR. O'BRIEN: I

"All in attendance and participating in the Tenth Annual Reciprocal Meat Conference do hereby express our sincere appreciation to the National Live Stock and Meat Board for the following services:

"1. Rendering assistance in formulating and carrying out the 1957 conference program.

"2. Making arrangements with the Morrison Hotel for room and conference facilities for the group.

"3. Providing registration, secretarial service, and meeting facilities -- as well as conference materials.

"4. Providing the group with a banquet which was not only a most enjoyable get-together but one of the highlights of the conference.

"5. Turning over to us the services of Ken Franklin who, as usual, has labored diligently to make this conference a success.

"6. For arranging and assisting in the various meats judging contests and the three live animal and carcass evaluation clinics held this year.

II

"The members of the conference wish to express their sincere appreciation to the deans, department heads and/or others for making attendance at this conference possible.

III

"All in attendance wish to extend our grateful thanks and sincere appreciation to:

The Executive and Program Committee.
The Conference Chairman.
The Personnel Committee headed by L. E. Kunkle.
All other committees and chairmen.
All outside speakers

for a well planned and successful program.

IV

"The participants in this conference wish to express their appreciation to the Russell Harrington Cutlery Company and to Mr. George B. Tupper, their representative, for his services and usual kind attention.

V

"We wish to express our sincere appreciation to the Chas. Pfizer Company for the generous contribution to college meats research.

VI

"We wish to express our appreciation to Dr. B. S. Schweigert and his staff at the American Meat Institute Foundation for their contributions to the conference program; especially are we appreciative of their interest, enthusiasm and efforts in planning and conducting the reciprocal meat conference short course.

VII

"Be it further resolved that we are deeply appreciative of the stimulating and constructive presentations by F. C. Klasing, Armour and Company; S. T. Shaw, Safeway Stores; R. E. Burrell, Rath Packing Company; and I. Rinehart, Godfrey Company.

"The Resolutions Committee, consisting of J. R. Stouffer, R. L. Reddish, B. H. Anderson, and Coleman O'Brien, as chairman, respectfully submit these resolutions and recommend their adoption and that they be made a part of the conference record."

DR. KEMP: I move that they be approved.

(The motion was seconded by several.)

CHAIRMAN BLUMER: You have heard the motion and the second and the question has been called for. All those in favor signify by saying aye to adopt the resolutions; opposed by the same sign. The resolutions have been adopted.

DR. MACKINTOSH: Are you open for new business?

CHAIRMAN BLUMER: Not at this point. I should like to finish up these details.

First there is a letter that is really addressed to the entire conference from Verlin Johnson. His letter reads:

"I am sorry to report that conditions beyond my control prevent my attendance at this year's conference. My purpose in this note is to tell you that I wish to continue to carry my share of the load of committee work, etc. My present committee assignments will be satisfactory if the new chairman is interested in such information.

"You might pass along to the Chairman of the Review Committee that I continue to check Foreign Agriculture, but our library does not have the zoological journal assigned to me.

"May you have the best of all conferences, and I sincerely hope that everyone is thoroughly inspired.

"Good luck to all and best results."

(Applause)

Now at this time Gene King has a letter from Roy Snyder that he would like to read.

MR. KING: On behalf of Roy Snyder, a very dear friend of mine and of most of you -- some of you may not know him but I am sure you have heard of him. He had the misfortune to lose his wife March 28. In talking to some of his very close friends at this conference they were not aware of this.

Flowers on behalf of the conference were sent to the funeral in Marshalltown, Iowa, and I have this little note from Roy which I should like to read to you at this time:

"During a time like this we learn to know how much our friends really mean to us. Your expression of sympathy will always be treasured."

And a personal note inside:

"To all members of the reciprocal meat conference: Just being remembered is something but from this group it means something more than any words I can put down could portray."

Signed: "Roy W. Snyder."

CHAIRMAN BLUMER: Thank you, Gene.

In the same vein, last year shortly after our conference, Mr. Helzer, whom many of you knew, passed away, and Mrs. Helzer has written a letter to the conference in response to a letter of sympathy which was written by last year's chairman, Al Pearson. I should like to read the letter to this conference:

"Dear Mr. Pearson: It was so kind of you to write and express sympathy for the reciprocal meat conference over the death of Mr. Helzer. Jim, Margaret and I wish to thank you, and will you please thank the conference at your next meeting?

"Sincerely,
Elizabeth Helzer"

Now at this time and before we have any more new business, I should like to turn the floor over to Ken Franklin.

SECRETARY-TREASURER FRANKLIN: With your permission, the Board would like to dedicate the proceedings of this year's conference to two men: Mr. Helzer, who was not a member of our group but was a meats man whom everybody respected, and also to our good friend who passed away during the year, a director of the AMI Foundation, Dr. Kraybill. We would appreciate a motion to that effect, if it meets with your approval.

DR. ADAMS: I will so move.

DR. WANDERSTOCK: Second.

CHAIRMAN BLUMER: You have heard the motion that we dedicate the proceedings of this meeting to Dr. Kraybill and Mr. Helzer. Are you ready for the question? The question has been called for. All those in favor signify by saying aye; opposed by the same sign. The motion is carried.

Ken has several other things on his mind. Do you wish to take them up at this time?

SECRETARY-TREASURER FRANKLIN: We are in the process of printing a set of carcass charts on 8½ by 11 paper. I am not going to dwell on them at great length. I will have copies out at the desk for anyone who would like to see them. What they are is an outline of the carcass with the bone structure printed in shade ink. We have printed them for our own people who are presently going around the country observing different cutting methods, and we have used this as a standard chart so that it can be written on as a record.

Mr. Cullen, who thought up the idea, thought that you folks might be interested in a supply of the charts for your college courses. We will make them available to you, and I will give you the cost figure outside. I will have a sheet for you, and you may order them if you wish. They will be available by approximately the first of September. Tom, in the interest of time I think that anyone who is interested can stop out in front and see them.

Our treasury, which, of course, is small to start with amounts at the present time to $14.10. Our treasury, of course, is only for such occasions as you have just heard Gene King mention -- flowers for deaths of associates and their families. If any of you desire to swell the coffers you will have an opportunity after the meeting closes. However, we are not too concerned about it. If we need more money for such events and we run into a hole I know that everyone will respond at our next meeting, and we are still in the black.

(Announcement as to dinner.)

SECRETARY-TREASURER FRANKLIN: Thank you, Tom.

CHAIRMAN BLUMER: For the next item of business I should like to call on Lowell Walters. We have an annoucement on new developments as regards the meat manual since yesterday.

DR. WALTERS: Mr. Chairman, although you did not call for old business, I think that few would argue that the topic about which we are remarking would classify under that category.

Your Meat Manual and Contest Committee met last night. It was deemed advisable to get in contact with the man in charge of the editing of this manual by telephone which we did. We gave him July 15 as the date for his completion of the manuscript, with the hope that a considerable portion of it will be ready, at least in printed form, by the middle of September or the first of October.

CHAIRMAN BLUMER: Thank you, Lowell. I think that is good news.

Now we will throw the floor open to business which you may wish to bring up.

DR. MACKINTOSH: The status of our treasury reminds me that a couple of years ago I made the suggestion that we have an enrollment fee, but I am not going to bring that up now. I still think that we should have an enrollment fee each year.

The thing I want to bring up at this time is that this is our tenth anniversary. We have a series of nine volumes covering the proceedings. The first year or two most of us could remember what was in each of the proceedings. And I know that most of us have had occasion during the years to refer to one or more of those volumes for information of some type. We found that it was getting to be quite a job to page through and find out that which we were looking for, and we thought that a card index or an index of some type for the proceedings from the beginning to date might be a good idea. Accordingly we have begun such an index and I have here the cards covering the first four volumes. By the first of September I expect we will have the first five volumes, and we will have the other four completed. There are 150 cards in this first bunch, and I imagine that about 200 will cover the next four because they are all somewhat thinner. Maybe there were no more articles and the individuals were just more verbose. I don't know.

I was wondering if there was some way in which we could make these available. I thought it should be brought up before the group to see what you think, whether you want it, and if you want it, how you want to have it done, or if you want to give it a thought. Iam merely stating that we have started and will have completed a card index for the first nine years by September 1 and it will be available to you to do as you please with it.

CHAIRMAN BLUMER: What is the thinking of the group on this matter?

DR. WELLINGTON: I would suggest that it be printed as an index in the back of the tenth issue of the proceedings.

CHAIRMAN BLUMER: Would that be agreeable?

SECRETARY-TREASURER FRANKLIN: Yes, that is agreeable with us if that is the wish of the group.

DR. NAUMANN: Possibly the Research Review Committee might consider this in its abstracting service.

CHAIRMAN BLUMER: Yes, that is a thought.

In order to conserve time that we have already gone way behind on, with your permission let's refer this to the Research Review Committee, if possible to get it in the back of the tenth proceedings report, if they deem such act advisable.

DR. PALMER: Tom, they could go on those cards mighty easily. If Davie will send them in we will process them in the normal manner and put them on the cards. We can have a special section just for the index of the proceedings.

CHAIRMAN BLUMER: I don't hear any objection to handing it over to the Research Review Committee; so unless I am contested so be it.

DR. PALMER: Davie is going to handle the abstracting, is he?

CHAIRMAN BIUMER: Is there other business? I hope not.

I should like to thank Mrs. Caplin, the recording secretary for her faithful work here and her patience in putting up with this group. I know that it must be pretty trying from time to time.

And I wish to thank Ken Franklin and Carl Neumann for their guidance and consolation during the past year.

And my Executive Committee: V. R. Cahill, J. D. Kemp, G. T. King, and Zane Palmer. This is not a one-man show by any means, and the Conference Chairman does very little, really, on this program because in addition he has 12 committee chairmen and they are the fellows who really put out. I greatly appreciate the cooperation that I received from them.

I sincerely hope that the group next year will get the same kind of cooperation that I had and enjoyed this year.

So at this time I should like to turn the floor over to the new Conference Chairman for next year, Dr. Vern Cahill.

DR. CAHILL: Thank you, Mr. Chairman.

CHAIRMAN BIUMER: Congratulations, Vern! (Applause)

DR. CAHILL: Thank you.

I thought that if I would sit quietly on my chair during this conference I could go home free and happy, but apparently you folks have jerked that out from under me and interpreted it as being laziness and suggested that work be done.

I was wrong in that estimation, but I don't believe I will be wrong in this one. If I promise to make this short and snappy I will extract the promise from you folks that during the year you will respond readily to all correspondence of your committee chairmen and that your papers for next year will be in on time.

Any suggestions that you have will come to us. And I should like to call your attention to these comments on the board: May we have your suggestions for next year? I think paper has been passed out.

New members, will you please indicate your committee preferences?

To the old members: If you desire change in your committee assignments, will you also make note of that?

The best way to get those would be to sit here until you wrote them out and handed them up to us. I will prevail on your good nature and perseverence if you will take care of it and hand them to us, any one of the Executive Committee, before you leave the banquet this evening.

We have three things I think to think about in planning these conferences. One is facilities. Ken Franklin and the Meat Board take care of that in excellent shape. The second is personnel. The committee members and every individual member will guide himself in that respect. The third one then is subject-matter and we have asked for your suggestions there.

I think that is all I have at this time except to ask the members of the Executive Committee to meet here for just 30 seconds at the close of this meeting.

DR. COLE: Mr. Chairman, do you need a motion to have another conference?

MR. CAHILL: I think perhaps that is automatic from what I hear in the background, and maybe it would be an insult for this group, Bill, to be asked if they want another conference after such an excellent conference as this one. The constitution has explained that for us.

DR. WALTERS: Mr. Chairman, I think that we should give Tom Blumer a good round of applause for the excellent way in which he has conducted the conference this year. (Applause)

DR. CAHILL: That is certainly a round of applause that is well deserved, Tom, and the Executive Committee enjoyed working with you.

We will see you at the banquet tonight at six o'clock.

(The conference adjourned at 5:30 o'clock.)
